COMMODORE

COMPUTING INTERNATIONAL

SPECIAL MEMORY ISSUE

MAY 1986

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Memory from tape to CD

MUSIC

a whole new wave of products

C16, Plus/4, Products List

Arcade Action Part 2

Hints and Tips for the 64 and 128

MegaReviews of the latest games

Amiga Hardware feature

Sound Expander
Sound Studio
MUSIC EXPANSION SYSTEM FOR THE COMMODORE 64 AND 128
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SEE INSIDE FOR MONEY OFF VOUCHERS

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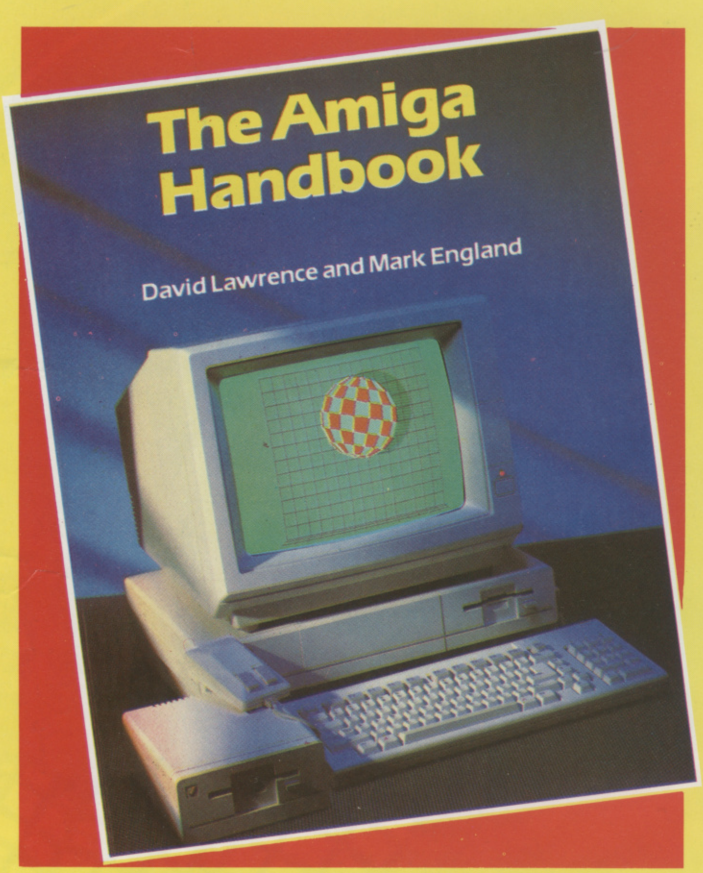

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Probably the best Commodore magazine in the universe!

COMMODORE
COMPUTING
INTERNATIONAL
Vol 4 No 10
May 1986

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Memory
+
MUSIC

= Compact Disc

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Exclusive preview of the 7th Commodore Show... memory maps for the Plus/4... guide to computing... incredible prizes to be won!

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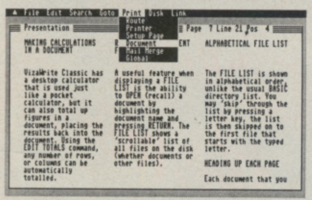
VIZAWRITE
PERSONAL WORD PROCESSOR
Classic 128



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MAKING CALCULATIONS        R               ENT   ALPHABETICAL FILE LIST
IN A DOCUMENT              F

VizaWrite Classic has      A useful feature when   The FILE LIST is shown
a desktop calculator       displaying a FILE       in alphabetical order,
that is used just          LIST is the ability     unlike the usual BASIC
like a pocket              to OPEN (recall) a      directory list. You
calculator, but it         document by             may 'skip' through the
can also total up          highlighting the        list by pressing a
figures in a               document name and       letter key, the list
document, placing the      pressing RETURN. The    is then skipped on to
results back into the      FILE LIST shows a       the first file that
document. Using the        'scrollable' list of    starts with the typed
EDIT TOTALS command,       all files on the disk   letter.
any number of rows,        (whether documents or
or columns can be          other files).           HEADING UP EACH PAGE
automatically
totalled.                                          Each document that you
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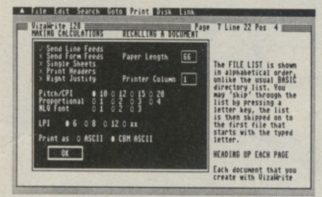

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VizaWrite 128                              Page  7 Line 22 Pos  4
MAKING CALCULATIONS     RECALLING A DOCUMENT

 ✓ Send Line Feeds
 x Send Form Feeds       Paper Length    66
 x Single Sheets                                The FILE LIST is shown
 x Print Headers                                in alphabetical order,
 x Right Justify         Printer Column  1      unlike the usual BASIC
                                                directory list. You
 Pitch/CPI      ● 10 ○ 12 ○ 15 ○ 20              may 'skip' through the
 Proportional   ○ 1  ○ 2  ○ 3  ○ 4               list by pressing a
 NLQ Font       ○ 1  ○ 2  ○ 3                    letter key, the list
                                                is then skipped on to
 LPI    ● 6  ○ 8  ○ 12 ○ xx                      the first file that
                                                starts with the typed
 Print as  ○ ASCII  ● CBM ASCII                  letter.

                                                HEADING UP EACH PAGE

                                                Each document that you
                                                create with VizaWrite
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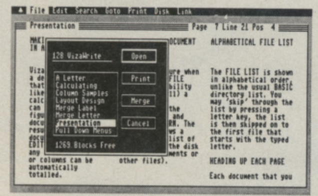

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MAKI                                 OCUMENT   ALPHABETICAL FILE LIST
IN A    128 VizaWrite

Viza    A Letter                     ure when  The FILE LIST is shown
a de    Calculating                  FILE      in alphabetical order,
that    Column Samples               bility    unlike the usual BASIC
like    Layout Design                ll) a     directory list. You
calc    Merge Label                            may 'skip' through the
can     Merge Letter                 the       list by pressing a
figu    Presentation                  and      letter key, the list
docu    Pull Down Menus              RN. The   is then skipped on to
resu                                 ws a      the first file that
docu    1269 Blocks Free             list of   starts with the typed
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or columns can be       other files).          HEADING UP EACH PAGE
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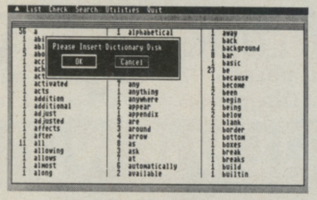

```
56  a              1  alphabetical     1  away
 1  abi                                1  back
 1  abl  Please Insert Dictionary Disk 1  background
 5  abo                                8  bar
 1  acc                                1  basic
 1  ach                               23  be
 1  act                                1  because
 1  activated      7  any              1  become
 1  acts           1  anything         2  been
 1  addition       1  anywhere         1  begin
 1  additional     2  appear           2  being
 1  adjust         1  appendix         2  below
 1  adjusted       9  are              1  blank
 1  affects        3  around           1  border
 1  after          4  arrow            1  bottom
11  all            8  as               1  boxes
 1  allowing       3  ask              1  break
 1  allows         7  at               1  breaks
 1  almost         6  automatically    1  build
 1  along          2  available        1  builtin
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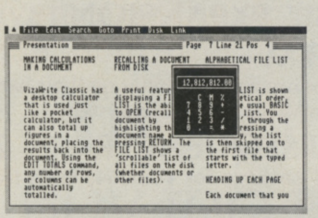

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Presentation                               Page  7 Line 21 Pos  4
MAKING CALCULATIONS     RECALLING A DOCUMENT   ALPHABETICAL FILE LIST
IN A DOCUMENT           FROM DISK

VizaWrite Classic has   A useful featur           LIST is shown
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that is used just       LIST is the abi           e usual BASIC
like a pocket           to OPEN (recall            list. You
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can also total up       highlighting th           ressing a
figures in a            document name a           y, the list
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results back into the   FILE LIST shows a      the first file that
document. Using the     'scrollable' list of   starts with the typed
EDIT TOTALS command,    all files on the disk  letter.
any number of rows,     (whether documents or
or columns can be       other files).          HEADING UP EACH PAGE
automatically
totalled.                                      Each document that you
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VizaWrite Classic is a high performance, easy-to-use word processing program designed for the Commodore 128 computer.

VizaWrite Classic takes full advantage of the colour, graphics and memory capabilities of the Commodore. Creating the full power and style of a dedicated word processing station, without the expense.

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- *Go to any page, instantly.*
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- *Glossary area, for quick insertion of frequently used phrases into a document.*
- *Full function calculator. Add, subtract, divide and multiply–directly or using figures in a document.*

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- *Page-based 'What You See Is What You Get'–word wraps and formats text, instantly, as you type. Alterations to layout are quick, easy and immediate.*
- *Format lines are used to set margins, tab stops, indentation and column drops.*
- *Simple to remember format symbols for tabs, indents and column processing.*
- *Automatic paragraph indentation, numerical tabbing, right alignment and centering.*
- *True 'newspaper style' columns, with variable width control, plus full editing and printing features.*
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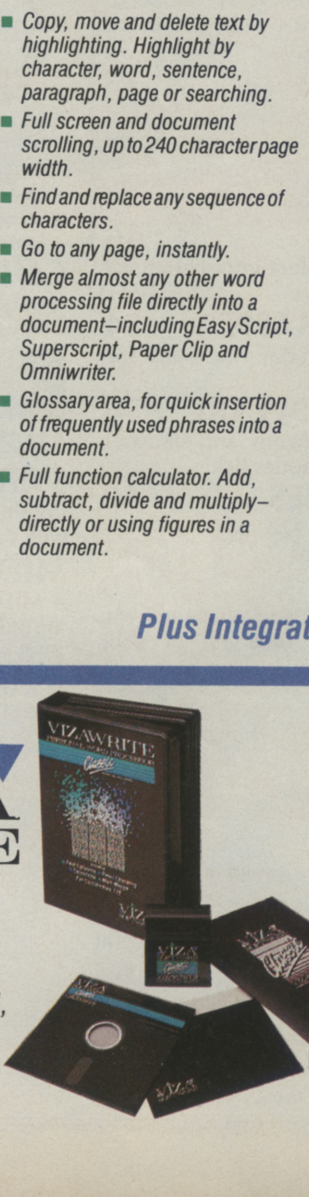

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...news ...news

STAR WARS SPRITES!

The US is showing great interest for its Star Wars programme in – believe it or not – Sprites! However, they're not exactly the sprites we know and love on our Commodore screens.

At the Rutherford Appleton Laboratory near Oxford they have invented a potential 'speed of light' weapon called, yes, 'Sprite'. It is a Krypton (Is it a bullet. Is it a Superman? Ed.) flouride laser pumped by an electron beam. And we all know what that is, don't we?

The original research was done as a part of a programme set up to perform experiments involving large pulses of lights for peaceful purposes in UK universities.

The US government Agency running the $26 billion Star Wars (Strategic Defense Initiative SDI), programme, regards this kind of laser as a promising method of 'zapping' decoys, designed to confuse defences, from the ground and leaving other weapons in space a clear view of genuine targets.

We can authoritatively deny the rumours that the author of CCI's occasional Sprite Corner series is in any way involved in creating weapons for the United States' Star Wars programme. Anyone interested, however, in offering their own Sprites for space should contact,

Lt. General James Abramson
Strategic Defense Initiative Organisation
Washington D.C.
U.S.A.

UK OR USA?

US software is in a dire condition, with some software houses on the edge of bankruptcy. So Peter Holmes of Bug-Byte told CCI after a visit to the Consumer Electronics Show in Las Vegas recently. The problem is the lack of investment and the weakening of creativity.

"In the UK, with its 56 million people crammed into a small island, with high unemployment in places like Sheffield or Leicester, the pressures on kids are so much greater," he says. "For many of them, who form themselves together in teams to write software it's the only way to get out, for status and for money. Except in New York, in the States people are much more laid back!"

Bug-Byte has been reversing the usual trend and selling games software to the US. "We have found there is a real demand for UK games, especially for the Plus/4. And much of the stuff being released in the UK now that comes from the US and is highly promoted is two or three years old and not really top quality," Peter Holmes told us. "If you want the best games software today that people really want to play, except for one or two US companies, there is nothing to compare with UK programmers and software houses!

Comments...

Dear Reader,

We live in a synthetic world. No, not a plastic, nylon or terylene globe but a world of synthesis – where differing factors are brought together into a single, preferably satisfying, whole. In this issue of CCI, you will find the main theme is 'Memory – lighting the corners of your mind'. The phrase comes from music, a song, but describes possibly the most important qualifying factor of a computer, its storage capacity. So Memory and Music ... brought together into one theme; synthesised and examined in a way that no other magazine has approached.

The synthesis of music and memory is not, however, accidental. Commodore's launch of the exciting new music expansion system encourages the use of the full facilities of a Commodore and all computer owners will benefit as the scope of their machines is hugely expanded by the increasingly popular CD Storage technology. So the timing is right to bring both sharply to your notice.

Though we hope that after you have read the music – memory features, you will know a great deal more – certainly enough to impress your friends! – about both, nevertheless beware ... for knowledge as power can bring its own problems, especially when politicians combine with computers, as our US correspondent points out. The games world too concerns us not just with mega-reviews but seriously, as a new device we cover lets you become, at least for games purposes, immortal. There are, in this issue, as always, many other varied fields in which we combine between our covers for your interest.

Bringing together in synthesis ... CCI itself, each month, is intent on combining many different aspects of the Commodore universe into one coherent picture. We are hopeful that it is presented in a useful way that informs and entertains you and maybe serves to help you toward more satisfying syntheses in your own world.

Yours sincerely,

Antony Jacobson
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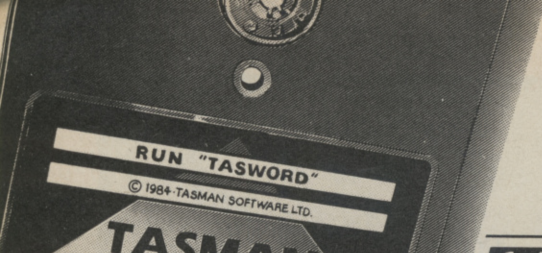

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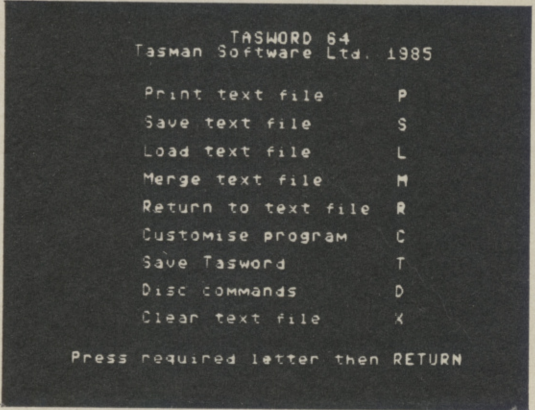

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        TASWORD 64
  Tasman Software Ltd. 1985

  Print text file        P
  Save text file         S
  Load text file         L
  Merge text file        M
  Return to text file    R
  Customise program      C
  Save Tasword           T
  Disc commands          D
  Clear text file        K

Press required letter then RETURN
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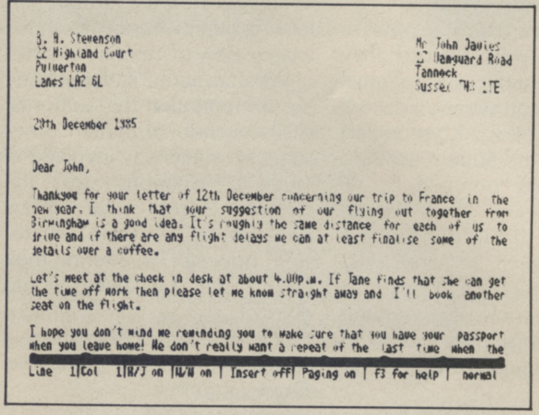

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B. A. Stevenson                                      Mr John Davies
22 Highland Court                                    17 Vanguard Road
Pulverton                                            Tannock
Lancs LA2 6L                                         Sussex TN3 1TE

20th December 1985

Dear John,

Thankyou for your letter of 12th December concerning our trip to France  in  the
new year. I  think  that  your  suggestion  of  our  flying  out  together  from
Birmingham is a good idea. It's roughly the same distance  for  each  of  us  to
drive and if there are any flight delays we can at least finalise  some  of  the
details over a coffee.

Let's meet at the check in desk at about 4.00p.m. If Jane finds that she can get
the time off work then please let me know straight away and  I'll  book  another
seat on the flight.

I hope you don't mind me reminding you to make sure that you have your  passport
when you leave home! We don't really want a repeat of the  last  time  when  the
Line   1|Col   1|R/J on |W/W on | Insert off| Paging on | f3 for help |  normal
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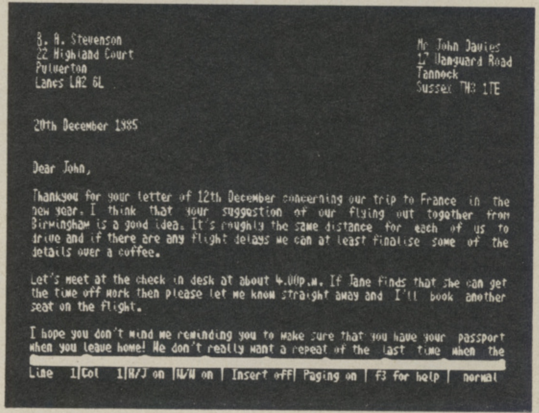

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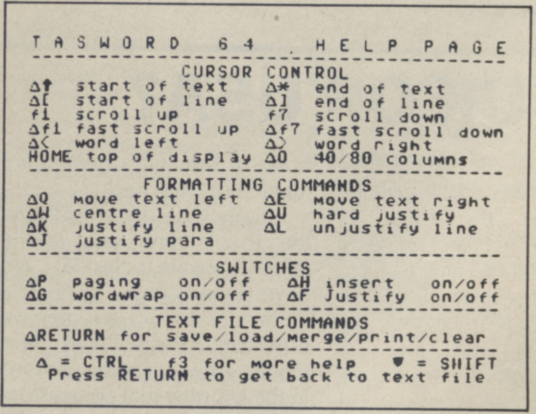

```
T A S W O R D   6 4   .  H E L P   P A G E
------------------------------------------
             CURSOR CONTROL
Δ↑   start of text       Δ*   end of text
Δ[   start of line       Δ]   end of line
f1   scroll up           f7   scroll down
Δf1  fast scroll up      Δf7  fast scroll down
Δ<   word left           Δ>   word right
HOME top of display      Δ0   40/80 columns
------------------------------------------
          FORMATTING COMMANDS
ΔQ   move text left      ΔE   move text right
ΔW   centre line         ΔU   hard justify
ΔK   justify line        ΔL   unjustify line
ΔJ   justify para
------------------------------------------
               SWITCHES
ΔP   paging   on/off     ΔH insert   on/off
ΔG   wordwrap on/off     ΔF Justify  on/off
------------------------------------------
          TEXT FILE COMMANDS
ΔRETURN for save/load/merge/print/clear
------------------------------------------
 Δ = CTRL    f3 for more help    ♥ = SHIFT
  Press RETURN to get back to text file
```

" Tasword is pretty unique product. It's 80-column display is well readable and backed up by a well thought out program that really can hold its own in professional use. " ***Commodore User November 1985***

TASWORD 64 is a new member of the highly acclaimed TASWORD family of word processing programs. Eighty characters per line on the screen is just one of the features of this versatile program. With the eighty character display you know that WHAT YOU SEE IS WHAT YOU WILL GET when you print your text. No need for text reformatting before printing and no need for horizontal scrolling.

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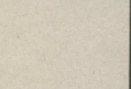
DISC	***£19.95***



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...news ...news

LASKYS TO SELL CHEAPER PC

It was announced recently that Laskys are to become the first high street retailers to sell Commodore's full range of IBM PC clones. Commodore also announced a substantial price drop, with the PC 10 now selling for under £1200.

To add to the package Laskys will be giving away a copy of 'Easy', Micropro's latest word processor, worth £165 and half an hour of telephone support from a special hotline.

Optional on-site maintenance will also be provided under Commodore's existing 'PC Cover Plus' scheme, and training too can be given if required.

Chris Kaday, acting general manager of Commodore said of the deal; ''We see the Laskys deal as a major coup for Commodore. As far as we're aware it is the first of its kind and I believe it heralds a new trend in PC retailing''.

QUILL ON CNET

Compunet has recently announced that games written using the Quill adventure writing system are to be offered as telesoftware, for downloading over the phone.

Compunet incorporate protection into the quilled games and then sell them for between £2 and £5. 'Quill Corner' as it is to be called will have adventures written by members and non members alike, and anyone wishing to get technical advice on preparing a game should contact Alan Lenton on 01-965 8866.

LET'S FLIP

To capitalise on the sucessful launch of their Disk Nibbler and Flippy Disks, Computatill Ltd have recently announced some excellent special offers that really make these products value for money.

The Disk Nibbler allows you to make both sides of a disk, read/write – and the Flippy Disks are specially designed to work well with the Nibbler.

Perhaps the best offer is to buy a box of Flippy Disks (R.R.P.£23) for £19.95 and get a free nibbler (R.R.P. £9.95) thrown in. For other offers contact Computatill on 061–652 8006.

BITS FOR LESS

People who need anything to do with computing could do worse than get in contact with DNCS. The new DNCS catalogue can provide you with anything from highly complicated leads, through disks, paper all the way to modems and hardware accessories.

The catalogue is available free, and for more details you should contact DNCS on 0706–67567.

COPYRIGHT CATCHES THEM

Police in Wandsworth, South London have, whilst following up a lead, raided a software retailer; in what could be the first prosecution under the new software copyright laws.

The shop, Soft Focus, was raided by four plain clothes officers due to the alleged sales of copied TABS accounting packages. A man is helping the Fraud Squad with their enquiries.

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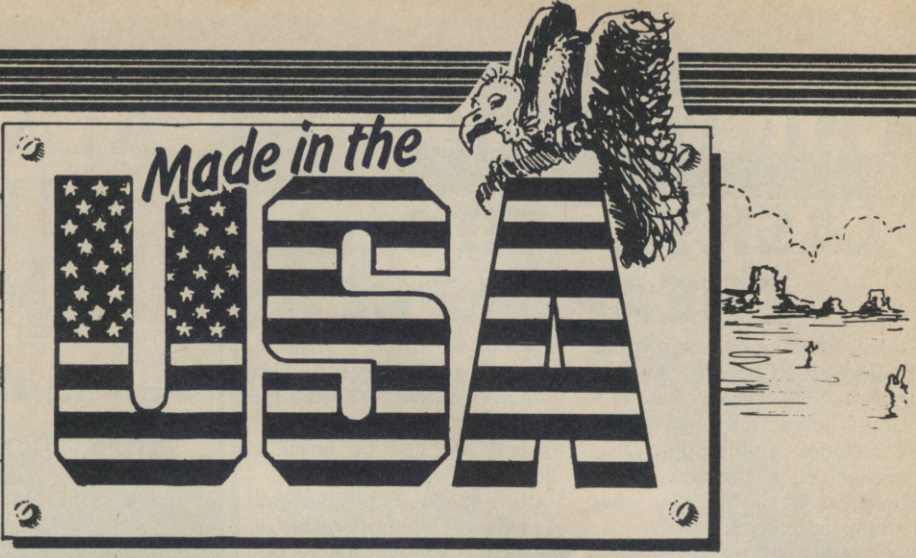


The Commodore 128 is beginning to sail off the shelves in big numbers. That may be one reason why Commodore's bankers cheered, bit on the biscuit and rolled over their around $200 million of loans to the world's largest small computer marker. As one banker said "If you owe your bank two thousand bucks and you can't pay, you're in trouble. If you owe your bank 200 million bucks and you can't pay, then it's the bank that's in trouble".

As the pace of C.128 sales quickens, its not only doing Big C a power of good but the software houses are chasing the bandwagon, too. New packages are appearing all the time. Digital Solutions are putting out well received 128 versions of their Paperback series of W/P, Database and Spread Sheet at about $50 each; or, if you already have 64 versions, you can update at $15 a throw. Commodore has launched its own 128 Perfect series of W/P, Calc and Database, too. By the way, C.128 prices are drifting down. You can pick one up at $289.00 now and that includes a W/P package worth $69.00. The word is that by year's end 200 little green ones will buy you this, the most popular new machine on the market.

Meanwhile back at the ranch, the C.64 is still top hand and the river of software flows on. Do you want 'Peace of Mind'? Natch. Who doesn't? Well, the Down-to-Earth brand has got a package that claims to deliver it. (Oh yeah?) There are four application programs: 'Home Inventory', 'Private Messages', 'Vital Statistics' (No, not 38-23-37 but bank accounts, insurances etc) and an invaluable 'Credit Card Gauridan'. If you've got Amex Platinum plus 49 others it will take them all.

You can also get 'The Works' from First Star. ('Give him the works, Eddie!) 13 Programs on one disk for $49.95 running from Typing Teacher and Graphics Painter to Address Book and Math Races (Yup, Math Races, I kid you not).

One extraordinary – and very laudable – development is the release by APT of California of a free – yes, free – Actionaut robot game. APT (bless their public spirited cotton socks) say 'entertainment software should be more widely available and affordable'. All in favor say 'Aye'! Each copy of the program will reproduce copies and APT is actually encouraging users to copy it for friends. For a $3.00 registration fee, you get complete documentation and a subscription to the Actioneer newsletter. The program is both fun and trains you in elementary programming. It was created by award – winning game designer Bob Fulop. What do those APT guys eat....air?

It's a New Ballgame.

On the game front, an outstanding new baseball biggie is out just in time for the start of the season. (Ex-President Richard Nixon used to pitch the first ball of the new season for Washington.... And look what happened to him!) Statis Pro Baseball – by Avalon Hill – is a ballgame fan's dream. It lets you relive past pennant races and games, you can re-create present day matches or put together your own fantasy teams and let them slug it out. Even at $35.00 its good value.

Electronic Arts have brought out a follow-up to Wizardry and Ultima III – It's got 4 classes of magic user, 128 color monsters, 16 levels, full scrolling dungeons, and a 3D city in 400K worth on 2 disks. And you can even use the characters created in Wizardry and Ultima III. Wow!

Simulation addicts are still keeping well stoked. Signal is offering 'Train Dispatcher', 'Locomotive Switcher' and a submarine destroyer. Strategic Simulation's has released 'Colonial Conquest' – a turn of the century yarn where the U.S., England, France, Germany, Japan and Russia battle for global supremacy. Everybody wants to rule the world. nicht war? Or run the world. Fitnesswise, that is. Like, you know, Sportaid. Jump to it now with Aerobics (from Spinnaker) or Syntonic's CATO (Computer-Assisted Training Optimizer) or Cody's Compu–Coach or you can watch your fat intake (why should you want to watch your fat intake? Ed.) with Nanosecs 'The Nutritionist', Softsync's 'The 'Model Diet' or Practicorp's 'Total Health'.

If you really want to get into tip–top condition, you could lug about your computer and stuff in the System Go Carry–All. It'll take your keyboard, your disk drive and all the rest, not forgetting, of course, your 64 or 128. For just $49.95, it's yours, made - or at least sold - in the U.S.A.

Joe Gene Parris

(Next month more Made in U.S.A. and you'll meet the 11 and 12 year old nationwide computer stars - the Commodore Kids!)

Knowledge Really is Power

Technology is a fact of life today that even politicians have to face. But how many really do anything more than nodding intelligently dressed in a white coat on visits to high tech manufacturing units? However, John Sununu, the Governor of the State of New Hampshire, is not one of that kind. He preaches that the computer has a vital place in public decision-making and, unsurprisingly as a Massachusetts Institue of Technology trained engineer and self-taught programmer he puts his ideas into practice where it matters – in running his State's business. Through a PC and a modem in his office he can, with a secret password, tap straight into an IBM 4361 mainframe on which he has had reorganised financial reporting systems installed. He and his staff use Lotus 1 2 3 Spreadsheets. At home, or in the guvernatorial limo, he uses a portable HP to bring work from the office but he is not above fixing and using one of his eight children's Commodore home computer, when necessary.

His high tech 'get it done – now!' attitude has rubbed some other New Hampshire politicos very much the wrong way. When he tried to buy $2.5 million worth of DEC computers for use in schools, without asking anyone else, including the teachers, the legislature jumped in and blocked the project.

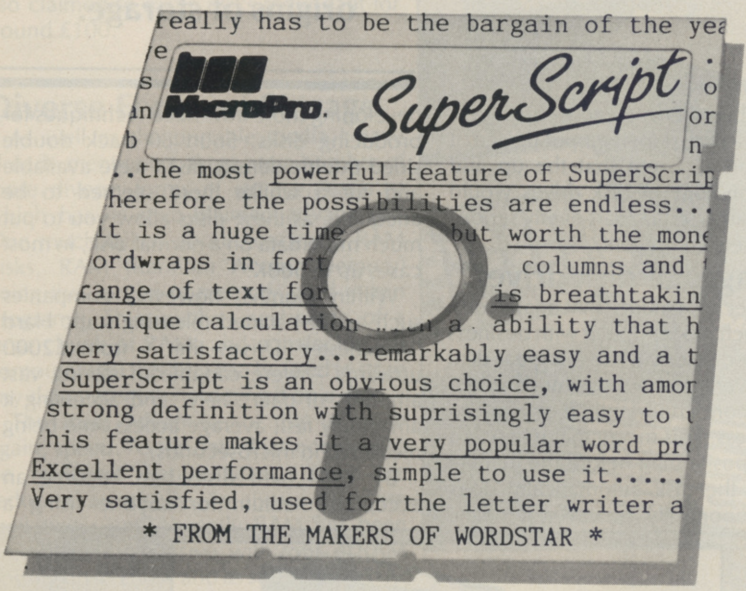
A further computer-based row – one that poses very basic problems about who gets access to what in government – has blown up over a new $5 million integrated financial software package he has had installed on the State's mainframe. Sununu refused, at first, to let anyone but himself and his team see what was in the database. The State Congressmen were furious 'They'll get what they need' he said sourly.

It took months of negotiation to get the computerized Governor to give a leading State politician a special password to let him review some, but only some, of the data.

Sununu is also resisting the New Hampshire's State Supreme Court ruling that allows citizens to copy public documents. He claims that the right to copy does not extend to computerized data. Some people see New Hampshire's Republican Governor and his computer skills as a forerunner of a new and necessary generation of technical whizz-kid politicians. Others see him, using access to information as a source of personal power, as a threat to public liberty. Ask them in Concord, the State capital, and they'll tell you what New Hampshire does today, Washington does tomorrow. They don't say if it will be good for us.

Joe Gene Parris.

WORDAHOLIC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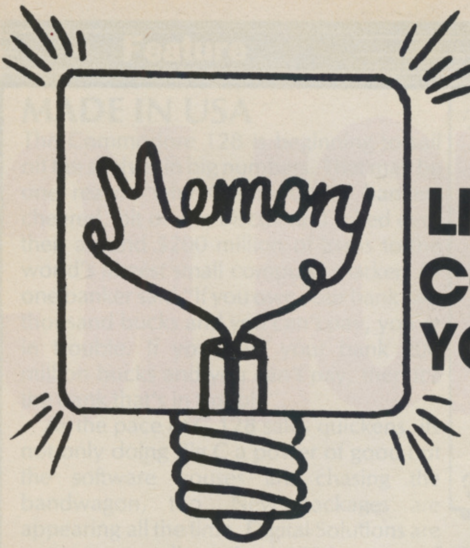


LIGHTS THE CORNERS OF YOUR MIND

Vast increases in speed and capacity of storage media appear frequently. Francis Jago looks back over the origins of storage.

Storage is perhaps the most topical subject in the world of computing at the moment; due mainly to the vast increases in speed and capacity of storage media that apparently appear every day.

Ten years ago, a mainframe would have been considered amazingly powerful if it had had anything more than 32K of available RAM; and computers tended to be left running continuously – eliminating the need for massed storage. Storing data, when this was necessary, consisted of a slow and unreliable attempt at putting the data on to 2'' reels of tape.

With the advent of true micro-chip technology, the average memory size for a home computer rocketed up from as little as 1K in 1981, until now, in 1986, anything less than 128K is considered restricting, and 1 Megabyte business machines are commonplace. To cope with this increase in adressable RAM, the size and speed of basic storage methods increased dramatically, while the prices plummeted.

Storing data is an absolute essential

To describe the development of storage media it is best to start with the original methods and see how and why they developed. Once people realised that storing data was no longer a laborious bore, but an absolute essential, major electronics companies started pouring money into research on how to make data safe and transportable.

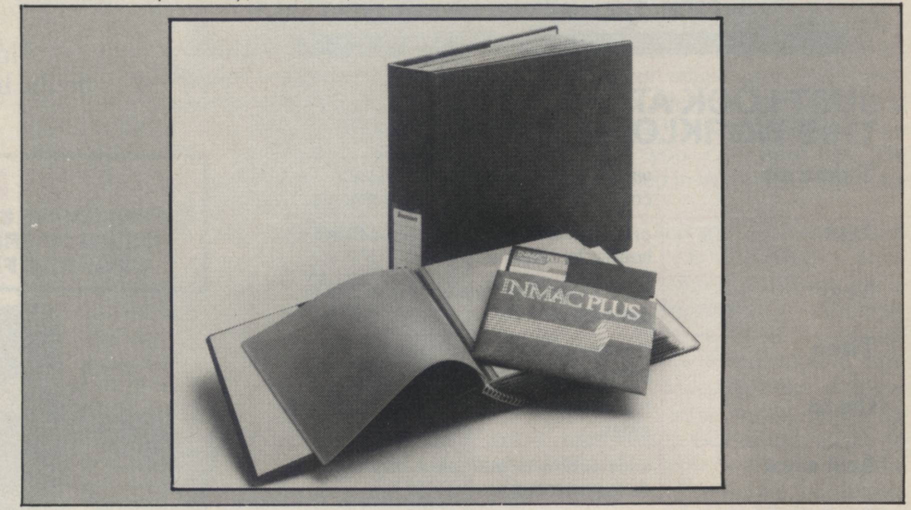
Using tapes was the obvious method; having been seen as a successful storage medium for music it was only a matter of time before someone used them for computer data. To this day tapes are still the most common form of storage for home computers, being cheap and relatively reliable.

Using flexible tape has many problems, and it was these that led to people trying to develop new and improved methods of keeping data. The first problem with tape storage is speed. There are difficulties in recording enormous amounts of high and low level signals onto tape (distortion as well as quantity) – one small drop-out on a tape can be the difference between a successful load, and many hours of wasted work.

Although home computer users still rely on cassettes as the primary input device, it soon became apparent that the up and coming technology of disk drives would prove to be an essential part of any serious computer users equipment.

Advantages of disk drives

It was special features that made disk drives so much more popular with business users. Firstly disk drives were a great deal faster – on average about 10 times faster! – and much more importantly they allowed random access. This meant that whereas a tape needs positioning before the loading takes pace, the disk automatically does this. More importantly, however, it means that data can be taken from individual files at speed, something that normal cassettes could never do. It also meant that when saving data created on the micro, no longer did you have to worry about where it would be put, the disks operating system would automatically take care of that too.



However, even this storage system caused problems. Disks are so thin and flexible (especially the large capacity 8'' ones) they tend to corrupt easily especially in a frantic office environment, where disks are frequently moved from machine to machine.

More Advanced Techniques

This problem, together with the ever growing need for more capacity – mainly to keep pace with RAM –, saw people developing more advanced techniques for producing disks. Soon 80 track double sided double density disks were available and for a whilke these seemed to be adequate, as these disks allow you to put much more data on a normal disk, in most cases up to 500K.

Within months, however, companies such as IBM started releasing static Hard 'Winchester' Drives that – from £2000 upwards – were capable of storing vast amounts of data safely, and accessing it amazingly fast, average access time being measured in microseconds.

By 1984 hard disks had become an accepted medium for anyone using a business machine, and with sizes advancing from 5 to 40 and even 60 megabytes (60,000,000 bytes of information) within two years, which it seemed possible would prove adequate for almost everyone.

Moving Sideways

Meanwhile many companies were developing what can only be considered as sideways moves. Sony, Hitachi, and other large Japanese groups decided that one way in which to reduce the dangers of losing data on a disk was effectively, to stop them being floppy. There soon became available 3'' and 3.5'' drives where the media was contained in a neat, inflexible plastic cover. This did not necessarily change actual storage capacity, but the dangers of corruption were reduced enough to justify to many users the expenditure of setting up such a system, using them as Commodore have just done with the Amiga.

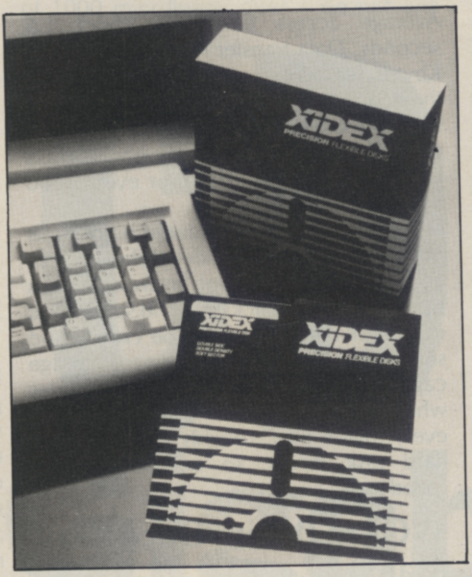
Another disk related media that received a lot of publicity during 1985 was Wafer/continuous loop drives. BBC owners could purchase a micro cassette drive called 'Hobbit' that would effectively do everything a disk would – only cheaper, around £100. Unfortunately, this failed due to lack of software support, as did Entrepro's wafer drive for the 64, which also claimed to make disks redundant for around £100.

Diverse Forms of Storage

As well as the portable media I have already mentioned, there are a number of more diverse forms of storage, each of which has its own claimed advantages. One much talked about concept is RAM disks, RAM (Random Access Memory) being the section of memory used to run programs. This involves sectioning of a large chunk of RAM, and convincing the computer that this area can be used to store any data, rather than putting it on a disk.

The main advantage of this is, once again, speed. As the data does not need to be retrieved, hence access times are reduce dramatically. As always there are limitations; until recently RAM has been prohibitively expensive, with 256K of RAM costing up to £600, and as such, large RAM disks have proved impractical. Another problem was getting the operating system to cope with this amount of inaccessable RAM – admittedly more of a software problem, but one which in my view has seen the death of what could have been a very promising idea.

Now RAM has dropped in price dramatically, 256K could probably now be picked up for around £75, to such a degree that a friend of mine actually worked out that it would be cheaper to get 5 Megabytes of RAM than to purchase a hard disk!

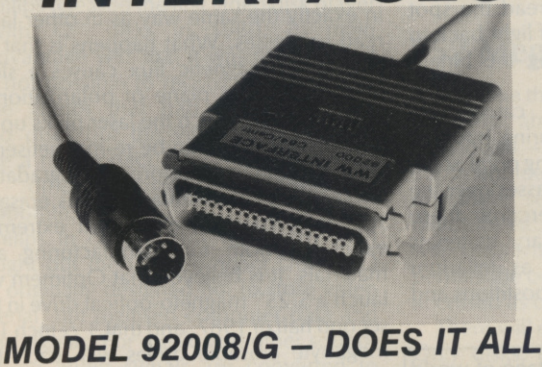


Bigger and Better

As you can read in the article on laser disk technology (elsewhere in this issue), the search for faster, bigger and better (OK JR, Ed!) disks is still going on, and with computers such as the Amiga, which can theoretically access 8 Megabytes of RAM instantly, and use it either for running programs or storing data, this is not surprising!

One possibility that might be developed more for business applications are ROMs (Read Only Memory). Popularised by the BBC micro (although in a small way) I see a great future in producing programs that do not need to be loaded or saved into memory, but are simply accessed each time you need them. Again the speed increase would be noticable to say the least, and ROMs prices too have lowered dramatically in price, with a 16K chip having dropped from £25 in 1983 to less than £8 now.

In conclusion, it is easy to see that a computer memories increase, so people will see the need to have databases with 20 or more billion characters. With compact disc technology now being applied to storage, it will not be too long before you will be able to purchase business machines with a gigabyte of memory. Whether this is like having a car that can travel at 300 miles an hour and runs on normal roads, I leave you to decide.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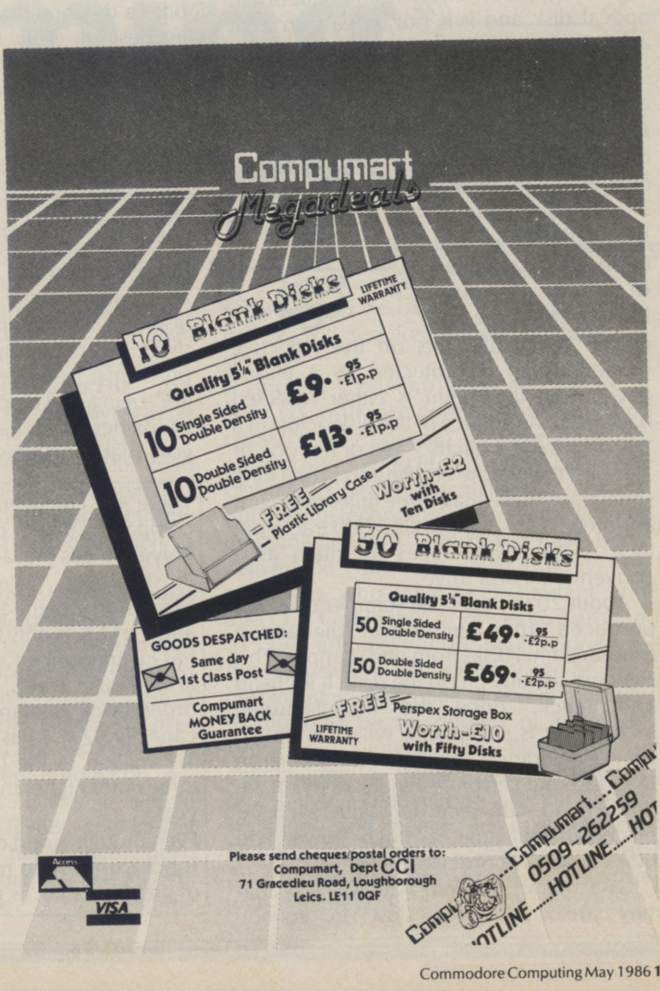
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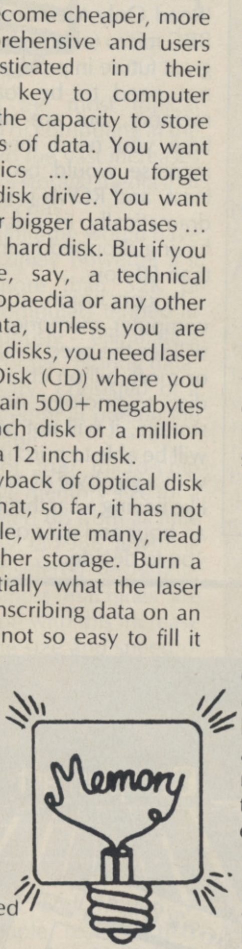
Laser Disks – How They Work

Cassette ... flexible disk ... hard disk ... As computers become cheaper, more available and comprehensive and users increasingly sophisticated in their demands, a major key to computer progress is seen as the capacity to store ever greater amounts of data. You want better game graphics ... you forget cassettes and get a disk drive. You want more storage for your bigger databases ... you get a Winchester hard disk. But if you really want to store, say, a technical manual or an encyclopaedia or any other huge amount of data, unless you are prepared to use many disks, you need laser storage – Compact Disk (CD) where you are already able to retain 500+ megabytes on one small 5.25 inch disk or a million bytes (a gigabyte) on a 12 inch disk.

However, the drawback of optical disk (laser) technolgoy is that, so far, it has not developed the erasable, write many, read many, capacity of other storage. Burn a hole, which is essentially what the laser technology does, in inscribing data on an optical disk and it is not so easy to fill it again for future use.

Audio CD, for example, is just a pre-recorded read only disk that cannot be changed or re-written. The data is imposed by creating tiny holes or pits on the surface of the disk. A focussed laser beam in the player 'reads' the pits on the reflective surface which is protected by a plastic cover. The laser light is either reflected back from the surface of the disk or lost in a 'pit' – forming a binary – yes or no, one or zero. All the pits are configured in one long sprial track more than three miles in length. Theoretically, a CD has 625,000 tracks per inch – some 600 times as much as a conventional disk drive.



About 20 thin metallic stamper disks are produced from one master die and a thousand final disks from one stamper. This punches the tiny pits in the disk. It is cheap and quick, once the manufacturing technology is successful, which is not so easy as tolerances are down to ¼ micron to reduce data error. Magnetic disks on the other hand, are recorded with each bit placed in real time, a much slower and more expensive process.

One major problem with CD's is that they are themselves slow in action. Average access times are about 1.5 seconds. Data transfer rates of about 175 Kbytes per second are abut 10 times slower than comparable ordinary disk drives. The speed problems are largely associated with poor error rates on all optical disks (approximately 1^{10} or 1 error every 1000 bits of information).

In consumer video or audio disks this is not a real probelm. In video it shows up as an instant blanking of one or two scan lines per frame or as a click or gap in sound. But computer data errors can be crucial and some of the CD's extraordinary storage capacity is used by error correction codes which reduce error rate to 1^{12} (1 error in every trillion bits), roughly equal to most hard disk drives, so counterbalancing speed loss.

WORM (Write Once Read Many)

WORM drives are now coming onto the market. These allow users to write data onto a disk and read it back as many times as desired. This technology cannot be extended to the Write Many (erasable) disks because for the writing operation, the laser beam is intensified and burns or melts a spot on the disk. When read the spot reflects a reduced amount of light back to the photo sensor, producing the binary effect again.

The process sometimes causes gas bubbles to distort neighbouring bits and also requires a very low melting point as the laser has so little time as it passes over the disk. In an attempt to overcome these problems, some extraordinary materials are being developed such as tellarium suboxides, silver halide compostitions and gold-platinium alloys.

There is a considerable shortage of world compact disk production capacity. Polygram has the largest plant in the world in Hanover, West Germany. Rapid expansion is planned in Japan and the U.S. and the U.K.'s only CD producer, Nimbus, has jut announced an £8 million expansion at its plant in Wales. Nimbus have said their order book is standing at 5 times their capacity. U.K. sales of compact disks were 1.2 million in the last 3 months of 1985 three times higher than the same period last year.

Even though world capacity is expanding it is not expected to match demand as sales of players rocket as prices fall.

Erasable Disks

The erasable disk is clearly the aim of the future optical market. It is predicted that erasable drives will reach the public in late 1987.

However, erasability requires the solving of many problems. The Write Once technology of burning holes in the surface will not work if you need to use the same spot again for new data. There must be developed means of only temporarily affecting the surface of the disk

A combined process of magneto-optics looks the most favouarable option at present. For this the optical disk is coated with an extremely thin layer of a highly magnetic substance. When a write operation takes place, the laser beam heats up a tiny spot to very high temperatures and causes the spot temporarily to lose its magnetism – this is a well-known phenomenon called the Curie Point. As the substance cools, it assumes a magnetic direction influenced by an external field – which forces the magnetic flux lines into one direction or the other.

For reading purposes, the laser power is substantially reduced and, as it passes over the disk, the reflectivity (or lack of it) is read in exactly the same way as in other laser-read processes. What happens is that the change of magnetic flux causes a slight alteration in the plane of polarization of reflected light, which the laser picks up.

The same spot can be re-magnetised at least a million times before any degradation occurs. The disadvantage of this erasable system is that it is at present extremely expensive both for manufacturing and materials. It is believed that Optimem will lauch a 5.25" magneto-optical drive in the second half of 1987, and that 3½ inch 100 megabyte erasable drives will reach the market by 1988. However, looking even further ahead there is research being done in which a special dye is used on a polymer material that can be melted and remelted many times – a potentially much more economic process.

The penetration of the storage market by optical drives is still small. Probably no more than 1500 drives of all sizes have so far been sold. But there can be no question that, as the technology rapidly spreads, so the price falls will bring the laser drive and disk to every sector of the computer world. By the end of the decade, the laser disk, almost unknown a year ago will be just another familiar storage medium.

Anthony Mael

CD The Gigabytes Are Coming

Magnetic media – tapes and disks – have considerable limitations in storage. The problem of trying to increase the data capacity of magnetic storage is that it is limited by the number of bits per inch which can be stored, the number of tracks on the surface of the disk and the distance between the read head and the magnetic surface.

The present capacity of an ordinary 3.5 floppy disk is 5 megabytes. By 1993 this is forecast to reach about 200 megaytes. But even now an ordinary CD ROM can store 500 megabytes and 12 inch versions such as Optimem – 1 gigabyte (1000 megabytes).

Optical disks have advantages over other magnetic media in that they are cheaper and have a hugely greater storage capacity. They are especially useful for military purposes as they are not affected by intense magnetic fields – as would happen in an atomic attack. Of course, as yet, their life span is still unknown. It is claimed that 10 years is the least period likely but that is based on accelerated ageing tests. Estimated eventual prices are around predicted to be $50 per disk for a minimum of 500 Megabytes.

Philips released the first video disk player – with 12″ disks in 1980. Its main disadvantage was that it was read only. It was not possible to record onto the disk. Some games that had animation used video disks but the video disk failed to make a real impact. It was too expensive and other companies refused to collaborate.

Philips in conjunction with Sony then brought out the CD (Compact Disk). CD was originally designed not to store video material, but digitised computer data and audio signals. For music and other sound, digitised audio signals are converted to analogue signals to play through oridinary amplifiers and loud speakers. There is now most importantly, a generally accepted format for all CD players and prices are falling to under £200 for a CD player and £10 for a disk.

Compact disks for audio and for computer data are virtually the same. However, the players for these are very different as the computer CD – ROM (Read Only Memory) players have a substantial amount of built-in error correction circuits. For music (or speech) it is possible to tolerate an occasional jump or mini-sound gap, but this is unacceptable for a computer, causing a loss of data. Some computer CD – ROM's however, provide a combined audio and computer data option, which is useful for interspersing voice or even music, if that is needed to go with the computer data, in, for example, spoken instructions or error messages.

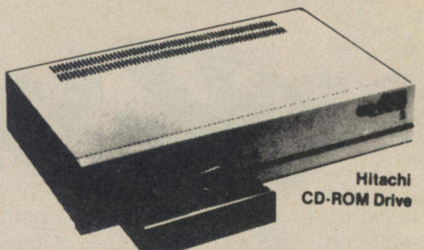
CD started as read-only which has, of course, the considerable limitation of being a one-way medium, and many applications require input or interaction. You can already buy for under £1,000 a CD computer player, a Hitachi, that will store 270,000 bytes – that's the equivalent of 1000 mini floppy disks – on just one compact disk.

552 Megabytes

To make the CD compatible with a PC – normally able to deal with only 32 megabytes – Hitachi have come up with the bright idea of splitting the disk into 32 megabyte sections each with its own directory etc. There is in any case another way out; which is to use LaserDos. This permits the complete 552 megabytes to be accessed as one MS or PC Dos drive.

There will certainly be a market for Read Only disks, for example, encyclopaedias and other library functions; for electronic publishing and interactive media such as games.

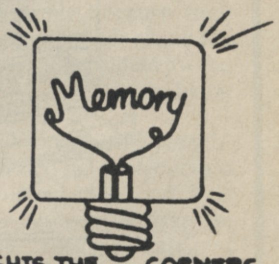
Nevertheless, the biggest growth areas will be in WORM (Write once read many) and erasable disks. There is some doubt whether the home computer market would be quickly opened with CD drives costing £1,000 up at present but business uses abound and sales of CD drives in the US, where most development is going on, are estimated to rise from $5 million in 1985 to over $100 million in 1988. The largest number of laser drives has probably been sold in Japan by companies like Hitachi and Fujitsu. Japanese, a pictographic language, can be recorded as digitised images on a laser disk.


Hitachi CD-ROM Drive

Microsoft organised recently a CD-ROM conference, in Seattle, USA to bring the technology to wider audience but also to attempt to get accepted software standards especially for 550 megabyte ROM's.

Hardware compatibility is being sought by US grouping called High Sierra. This comprises some 12 major software and hardware manufacturers such as DEC and Microsoft and aims to help standardise disk volume structures, directories and file systems.

The kind of CD application already planned is putting onto laser disk the entire records of the US Patent Office. This mammoth task, for which Optiemem, a subsidiary of Xerox Inc. is supplying the drives, will require 30,000 gigabytes of storage.



LIGHTS THE CORNERS OF YOUR MIND

Another Optimem application is for a large US insurance company whose claim contracts will go onto 10 laser drives to serve around 2000 PC's. George Dundon, Optimem's UK Technical Manager, points out that the technology is no longer untried or revolutionary. "The drives have been deliverable for two years. It is the cusomters who have been hesitant', he told CCI. Optimem 12″ drives cost around $13,000 and disks about $400 at present. But, Dundon points out, they can be very cost effective. Magnetic tapes are officially required to be re-spooled or refreshed every six months. So the cost of maintaining a large tape library is prohibitive. Whereas one laser disk holds 50 tapes and needs no maintenance. Dundon predicts, too, that optical disk drive prices will soon prove competitive with Winchesters.

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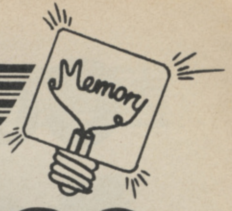


Inside Compact Disc

The Compact Disc is a marvel of modern microscopic engineering. Its future will take it into the world of computers. Here Basil Lane examines the first use it has been put to – hi-fi sound.

When Compact disc was first announced to the world in 1980, few people believed just how rapidly it would overtake the older black vinyl LP disc. Fewer still realised that Compact disc, as envisaged by its inventors, Philips and Sony, held a potential far beyond that of a carrier of high fidelity music.

In fact, by the time the exhaustive procedure of printing an international standard had been achieved, a list of 250 applications had been added – and just now some of these are beginning to appear in the market.

Compact disc has become a genuine success as a neater and more accurate source of hi-fi music than its predecessor . Indeed, sales of discs and players are rising so rapidly that disc pressing plants still find it diifficult to catch up with the demand.

Very recently a further development to be called CDI (Compact Disc Interactive) was announced, the detailed specification of which are expected to be completed by the end of this year. In 1987, a new generation of players may be launched which will deal with music and CDI discs, as well as the existing advanced computer information storage discs called CD-ROM.

CDI, by the way, refers to a new type of Compact Disc that can carry many parallel speech channels, video and computer graphics as well as text. It can be expected to act as a simple peripheral to many home computers, including those from Commodore. However, don't rush to the store yet – it will be a while before software houses get round to it, but when they do – watch out!

So just why is the Compact disc such a useful all-purpose device? Perhaps the best way to explain this is to describe in simple terms just what the disc consists of, and how it is played.

The Compact Disc Format

Anything recorded on a compact disc has to be in the form of digital signals. This is because the disc recording consists of a series of small pits, each of which can represent between one and eight bits of data, arranged in a continuous spiral track from the disc centre to the outer edge.

In total, some 20,000 tracks can be arrranged across the disc radius, allowing for some 7Gbits of date to be recorded. Of course, not all of these bits belong to the recording engineer, since some are used for error detection and correction, some to provide synchronisation and some to provide an index of contents of the recording. Finally, a certain percentage are also reserved for special purposes which could include the provision of graphics to accompany the music!

All this does begin to explain why the disc is so versatile. The part of the data that is reserved for information – amounting to between 550Mbytes and 620Mbytes – the bits could be an encoding of anything – music, video, computer programs or text. All this is based on the assumption that they conform to one or other of the various Compact disc standards.

The disc itself is formed from a thin rigid piece of polycarbonate plastic, 12cm in diameter, moulded in a press. One face of the press consists of a stamper which contains the recording as a spiral of raised bumps. The disc surface that carries the spiral track is then coated with a thin film of reflective aluminium, which is itself covered with a further plastic coat and printed with the disc label.

Actually putting the recording inside the plastic is useful to the player because it 'reads' the disc by shining a tiny laser spot onto the track. The power of the reflected light is sensed as the track passes underneath. By the way, it should by now have occured to some readers that the only way to read the disc is through the side opposite the label, where the moulded pits trapped inside the plastic now look like bumps.

The physical size of the bits on the disc remain constant because the speed the disc rotated in recording, and subsequently in the player, varies from 200rpm to 500rpm as the track is followed from inner diameter to the edge.

The Player

Currently, the players intended for CD-ROM disc drives for attachment to personal computers are different to those used to play music. Since the latter are rather more important, these will be briefly described to explain how they work.

Unlike the players used to replay hi-fi LPs, the CD player doesn't need to revolve the disc at absolutely precise speeds. In fact, this is controlled by counting the time interval between one synchronisation pulse read off the disc, and the next one. If there is an error , an electronic circuit changes the speed to the right value.

As mentioned earlier, the disc information is with the aid of a laser beam used to illuminate the width of just one track. The light is shone through a complex lens assembly which focusses it to a tiny spot. If the disc is warped and the spot of light is defocussed, clever sensing devices can detect this and continuously refocus the lens.

Where the laser strikes a smooth part of track representing one or more zeros, the full beam is reflected back into the lens. This reflection is split from the outgoing beam and directed onto a photosensitive diode. AS a bump passes under the beam, the light is scattered and the photodiode 'sees' a drop in light power, which it registers as a 'one'.

Because the 'reading head' and the disc are never in contact with one another, dirt, finger prints and scratches don't necessarily cause a problem. This is because at the surface, the laser beam has not reached focus and is only partially obstructed. Most light still gets to the track and can pass back to the sensor.

However, in the event that some bits get lost because the surface imperfection is large enough to completely obstruct the beam, the error detection system comes into operation and the lost data restored. This is done fairly simply because each block of data is repeated further round the track and can be used to substitute for the original in the event of an error being spotted.

Steering the laser head is a delicate job. For a start, the separation between tracks is only about 1.4 micrometres, and it is possible that some discs may have an eccentric centre hole causing an apparent track wobble of up to 50 micrometres.

Surprisingly, the steering is also done using the reading head to see where it is in relation to the track. Servo circuits constantly monitor the head to track position and when an error occurs drive the head to the right place.

The data stream coming from the photodiode is split into several components – to control disc speed, to provide tracking information, to detect and correct errors and, most importantly, to extract the digital sound and pass it directly to a digital to analogue converter. This turns the data back into the originally recorded sound, free from disc or player imperfections – a gloriously accurate rendition of the sound the recording engineer intended you to hear!

The compact disc systems therefore, although described superficially here, is surprisingly complex – and its disc a marvel of modern microscopic engineering. It is hardly surprising that although its first use has been for hi-fi sound, its future will take it much further into the world of computers and television.

Compact Disc Sounds

If we're aroused your interest in CD players, here's a selection of reviews of what's available to play on it!

Glen Miller Orchestra: In The Digital Mood (GRP Records GRP—D—9502)

I first heard this CD in a nightclub of all places, and made my mind up then and there that I had to have a copy no matter how much I had to pay. Well, that was over a year ago, and I've finally managed to get hold of it, even. Though the price was a trifle on the high side for such a short disc (15 quid!).

What can you say? The man was a genius, pure and simple, and his mysterious death one of the major tragedies in the history of popular music. This disc contains 10 of his best known tracks played by 18 of the top session musicians in the world,and produced by another maestro Dave Grusin, ably helped by his partner Larry Rosen. You name it and it's here - In the Mood, Chattanooga Choo-Choo, String of Pearls, Kalamazoo, Pennsylvania 6-5000 and the classic Moonlight Serenade.

There's nothing more that need be said, but go out now, this minute and pester every CD shop you can get this disc. Don't rest until you have a copy in your hand, and whatever you do, never lend it to anybody or you will never see it again. This has to be one of the true masterpieces of the recording industry, and certainly the best CD I have ever heard.

The Glenn Miller Orchestra
In the Digital Mood
DIGITAL MASTER

Beethoven: Symphony No.9 'Choral Cleveland Orchestra/Dohnany (Telarc CD—80120)

This is probably one of Beethoven's best known works, and the main theme from the final movement is definitely one of the most—hummed pieces of music there is. This recording of the 'Choral' symphony is totally digital, and was recorded in the Masonic Auditorium in Cleveland, Ohio. The sound quality is excellent, and the balance attained by engineer Jack Renner, exemplary.

Beethoven composed this symphony to suggest hope, and 'a happy ending', and manages this by the simple expedient of beginning the symphony in the key of D minor, and finishing in the key of D major, with little flirts into F and B—flat in the meantime.

The sound here is lively, and the chorus perform well, as do the soloists, notably the bass Robert Lloyd. Playing time is well over the magic hour mark, and coupled with the sound quality makes this a disc to buy.

Phil Collins: No Jacket Required (Virgin CDV 2345)

This is the third album from master musician, arranger, producer, engineer, etc. Phil Collins, and it won the award for the Best Album of The Year at this year's BPI awards. The CD is of very high quality, despite being only an analogue recording, but the techniques that Mr. Collins uses employ modern studio resources to the full.

Ther disc contains the hit singles Sussudio, One More Night, and Don't Lose My Number, plus eight other great songs. Quality throughout, and Phil Collins use of drum machines alongside normal acoustic set—ups lends that unmistakable 'Colliins' sound to the rhythm section. There's some fine playing here by Daryl Stuermer on guitar, and The Phenix Horn section, as well as the incomparable Mr Collins.

In my opinion this disc deserved the award that it received, and ranks as my favourite disk of '85. It's well worth the extra money for the CD, but check that you get one that plays, as some of these British pressings by Nimbus have had a few problems.

Stanley Jordan : Magic Touch (Blue Note CDP 7 46092 2)

If there are any budding guitarists out there, then don't listen to this disc. If you have ever heard a guitarist that inspired you to try to play the guitar, then this guy will put you off it for life. He's too good! Stanley Jordan was discovered busking in the subways of New York, and signed on the spot to Blue Note records. Jordan has pioneered the method of guitar playing known as 'double tapping', and he is probably the greatest exponent of this style.

When you hear this disc you may find it hard to believe that there is only one guitarist here, and that there are no overdubs on the sound at all - but it's true. Everything here was recorded first take with just Jordan playing guitar. And to your average guitarist-in-the-street it can be sickening. I only wish I could play like this!

The recording here is totally digital, so the sound quality is pretty damn impressive, like the guitar playing. Note for note, this has to be one of the finest jazz recordings around at present.

Sting: The Dream of the Blue Turtles (A & M Dremd1)

This is the first solo offering from Sting since he left the Police, and has received much critical acclaim from the public, and other musicians alike. The disc contains a selection of Police—like material, but with a much more jazzy feel to it. Sting has managed to get himself a backing bank comprising of the cream of the modern jazz world of New York, and members of the band include Omar Hakim on drums, Darryl Jones on bass, and the wonderful brandford Marsalis on saxophone. Tracks here include If You Love Somebody (Set Them Free), Russians, and his new single Moon Over Bourbon Street, a qwuaint little ditty about a real life vampire that lived in New Orleans. The music is forceful for the most part, and, as I say, somewhat reminiscent of the Police in places.

Having forsaken the bass for the guitar, Sting has managed to come up with a creditable and polished solo debut, that sounds as good technically as it does musically. Definitely a CD to get your hands on.

STING
the dream of the blue turtles

Compact Disc Reviews: Chris Spalding Which Compact Disc? Magazine.

Amazing ARCADE$ Astonishing Action!

Well folks, due to mucho popular demand (thanx for writing dad!), I'm back for another look into the acion-packed world of arcades. This month I'll try to talk not just about the most recent games to hit the arcades, but ones which, very shortly, will be hitting the home computer market.

First, however, I'll bring you an update on one of the games I mentioned last month, which I had not managed to get a full go on – Nemesis by Konami. Graphically superb (as it should be for more than £2000) it combines many different horizontal scrolling ideas to create one awesome one.

To play Nemesis sucessfully you must travel along blastin' everythin' in sight and also keep your eyes open for the all important pods. These allow your craft extra facilities that can be selected when you most need them. Such essentials as Rapid fire, and multiple guns make killing the enemies a little easier (rather like Rambo with a nuclear warhead?). Overall Nemesis is an excellent, if pricy game, and one that I would recommend to everyone looking for a good exciting blast – slightly reminscent of the Defender days.

Next I'd like to deal with what can only be described as my game of the moment – Space Harrier. Everyone who has spent any time in arcades over the last two years will have played one of the Star Wars/Empire Strikes Back sit IN games. Playing these for me has always been more enjoyable as you do not have the distractions of others playing next to you and can therefore get really involved.

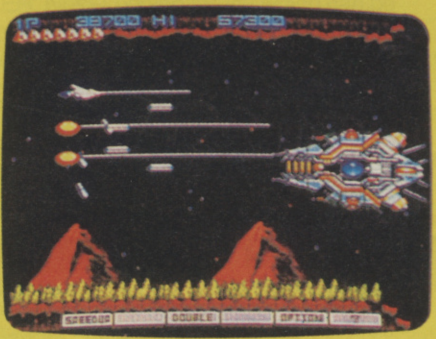
Space Harrier has taken this idea an awful lot further! In my view it has moved much more towards a simulator in real terms, and Space Harrier comes out of it as the most thrilling game I have ever played. It uses a complex set of hydraulics to make the whole cockpit (into which you must climb) move in an uncannily realistic and dramatic way.

Although it is another expensive game to play – the continuous play mode making it very easy to just keep on pumping in your 30-50p's – I found the adrenelin rushes really awesome; not unlike what I imagine driving a Lamborghini Countach at 160 mph through Picadilly would feel like (only with dragons going for you!).

The game itself puts you as a dragon-slayer whose sole purpose in life is to travel through many screens blasting everything that comes into sight, until – having finsihed a level – you come face to face with the truly evil dragon who you must shoot repeatedly before he engulfs you in flames.

Stereo speakers, tremendous effects and crystal clear graphics all add up to a game that (if I had a few grand spare) I would love to keep in the spare room. When playing this game it is asif you are transfered to a different world; one where all the wallies who are causing you grief cease to exist, it's just you against them!

To get back to arcade games which are to be converted to the 64/128, Imagine have recently announced that they plan to convert the hugely sucessful Green Beret game, and Elite, in keeping with their trend for Capcom games, have signed up the rights to Ghosts and Goblins, another arcade favourite.



New games that you can expect to see in the arcades within a few weeks are really quite plentiful, and with the ATE show (the arcade world's biggie) having just finished we should see some surprises. Ones to keep your eyes open for are Timber, by Bally/Midway, in which (surprise, surprise) you play a Lumberjack and definitely Bally Sente's Shrike Avenger, which is another Hydraulically controlled game.

Another one to look forward to is section Z from Capcom, using Jet Pac like graphics it looks like yet another sucess for the company of the moment.

Finally I'd like to talk about Nintendo's newest game, Arm Wrestling. All you fans of Punch-Out and Super Punch-Out will appreciate this one as, with dual screens and a variety of opponents it promises fun for all the family.

That just about wraps it up for this month. Hopefully next month I'll tell you some more about Shrike Avenger, as well as any new developments in the Arcade conversion world.

Francis Jago.

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MUSIC

Musik Messe

Vince Hill reports from Frankfurt's Musik Messe, the largest music trade fair of its kind in the world.

Although you will be reading this sometime in April it will still be sometime until the products mentioned here – if any – will appear on the shores of the UK.

CCI brings you news of all the major computer shows from all around the world but here is something completely different!

The Frankfurt Messe is a huge exhibition site situated in the centre of Frankfurt, West Germany. Every year a music trade fair is held, the largest of its kind in the world. To give you some idea of what it is like, this year there were 827 exhibitors from 32 countries. This year, as last year, Great Britain was the leader in exhibitors with 104 companies ranging from manufacturers of amplification equipment and mixing consoles to distributors with world wide exclusives on sound equipment.

The show held during the long winter in February is a meeting place for all and sundry, the inventors showing off their wares to the huge Japanese combines launching the very latest in sound and keyboard technology. Not only do you see the very latest musical instruments but you also hear the latest gossip and changes within the industry.

"The year of the sound sampler"

1986 is set to be the year – in electronic music terms – of the sound sampler. If you think the Commodore Sound Sampler or Microvox is pretty good then the specification of the Akai S900 should astound you with 12 seconds sampling time at 40kHz sampling frequency with a response of 20Hz to 16kHz rising up to 48 seconds of sampling time at a frequency of 10kHz. Don't forget that this type of instrument produces eight note polyphony!

Although most of the equipment seen at Frankfurt is dedicated,whether it be suquencing, sampling, synthesis it must be said that computers are beginning to be a common sight now amongst the grand pianos and pipe organs. Last year was when MIDI (Musical Instrument Digital Interface) software really hit the music instrument industry. This year it is better – less of it, but with wider applications.

The problem as no doubt many of you have found out is that some software is not compatible with some MIDI interfaces and vice-versa. Unfortunately as in the computer industry the software developers and distributors make more money selling their hardware and ensuring that the end user (that's you!) is trapped into their system. This problem has been very common with regard to MIDI software and it will never sort itself out.

Admittedly several manufacturers have brought out software which states it is compatible. Rainbird with The Advanced Music System is just one example where using SIEL or JMS interfaces sometimes do not work. The reason here is that Commodore released several versions of the C64 and SIEL and JMS amended their specs on the interfaces accordingly, did anybody tell Island Logic/System that? So depending on what interface version the software developers worked with you might or might not have problems! This also applies to Music Sales/SFX and the Sound Sampler where you need to get your Sampler hardware changed if you have either of those units, the latter being made more difficult as Music Sales still have not released their MIDI interface which is meant to be compatible with all!

"Commodore prevent display of Amiga software"

So walking around the 58,000 square meters of the Music proved to be interesting to see which new manufacturers had developed software which was compatible with other manufacturers interfaces and what computers were being supported. For those of you who are experienced in computer music technology will be aware that the limitations of the CBM 64 for MIDI purposes is due to its limited memory. In any other circumstances the C64 would come out on top but now the computer musician is wanting and demanding more. However that is not to say that there was nothing of importance and that the new software for the 64/128 uses the potential of these computers to the full. In the main it was the Apple IIe, Big Mac, IBM PC and Atari 130XE and 520 ST that had their futures within them. Due to the fact that the Amiga was not being launched in Europe until 5 March 1986, Commodore had issued an edict stating that no software/hardware should be displayed.

Starting off at the Music Sales stand, which showed a variety of existing product, there was a sample of the 'Home Entertainment Console'. This was a five octave keyboard which had a CBM 64 and 1541 disk drive built-in. It was quite neat, the QWERTY keyboard slid out in the centre and although housed on this sample to the left of the unit, the disk drive will eventually be housed on the top and look just like an Emulator (that's if you know what an Emulator looks like of course!). The monitor had not been decided upon at the time but this will sit dead centre and let's hope they make it colour!

The console contains the Sound Sampler and Sound Expander as standard. The Sampler has been updated to give eight second samples but only in a monophonic form. There will be three or four sampling rates available and the sounds of both sampler and expander can be mixed and played together with the sampler taking top note priority. Added to this will be a version of the Music Maker 2 and some play-along albums, all these may be 'booted' up from a menu which appears on power-up. An interestinng concept this as you can of course use the CBM 64 in its normal mode for playing games and any other utilities you find useful. The price? Well as always' it has not been decided yet' but I think it will come in at around £400.00.

Commodore are supporting the musical ability of their machine with the packages which are around, although for you disk users out there – tough luck! All the packages are designed for cassette software only but think about it, buy the cassette packages and then get disk updates for only £4.99 each piece of software other wise you will have to buy the required units singly.

Although not on display but well in the pipeline are the Composer and Sound Editor packages for the Commodore Sound Expander. The Composer sofware will be real-time based with full music notation. The notation, however, will be produced by transferring the sequence file into the notator file, full print out and lyric features will be present as well as having eight polyphonic tracks each capable of their own individual sound. The system is designed to be used with or without the FM module attached although no one told me why any one would want to use it without the Expander (answers on a postcard please!)?

"Programming can be heaven or hell"

The FM Sound Editor will contain programming for FM drums as well as the preset sounds . As owners of the Yamaha DX series synths know, programming can be heaven or hell! So the software will be easy to use, will be capable of programming all the features inherant to the FM chip and will be able to be used as a straight keyboard package when linked to the Sound Expander. Once your files have been generated these may be cross referenced to the Composer and hopefully the existing software which is sold with the Sound Expander.

Music Sales are currently working on an add-on module for the Amiga which features FM tone generation, A to D and D to A conversion plus MIDI, all for £125.00 or thereabouts!

On the SIEL stand there was nothing really new for the CBM 64 except for a tuition package which works with their MK range of keyboards and any MIDI keyboard via their interface. The software loads up in any of four languages plus options for RS232 or MIDI. The basis of these exercises are seen on the main menu with such titles as Finger Twister, Melodic and Harmonic Exercise, Repertoire and Sequencer.

Four stave notation is seen on the screen with a keyboard graphic at the top of the screen, it shows you what to play, if you get it wrong it tells you and so on...... Border screens change colour when you get the exercise correct and the software has a set of demo tunes on it so that you can see and hear what is being played. Nice idea and when it comes out we'll see if it works!

Just to fill you in, SIEL (UK) Ltd who were the distributors of SIEL products in the UK have now officially handed over distribution of the SIEL range to Chase Musicians, it is not currently known whether the computer peripherals are being handled by Chase but the product line should still be available through good computer and music outlets.

Joreth Music who initially developed their extremely versatile AL25 MIDI and sync interface have now added to their system with a real time linker system. This allows recording while loops are playing, sub-loops within parts of the Joreth real time system with 128 sub-loops available in 8 tracks. These sub-loops may be nested with directed 'GOTO' commands. In addition to this the software is capable of hi-speed part mix-down from tracks as well as printer output with comments and as enhanced real time editor. Joreth have also developed software to run on other manufacturers interfaces (how sensible!). Now for the first time SIEL, JMS and Microvox have a solid software back-up. Keep on the look out for Joreth Music products, they are going places!

"Stateside"

Syntech are a relatively new name in the software field. Based in the States they have had some success with their packages for C64/C128/Apple IIe and IBM PC. Again there is a little overlap to other interfaces. As they are Stateside, so the hardware that is supported is mainly available over there, but this problem is getting better and if they get good distribution in the UK things will change.

So if you have got a Syntech standard, Passport or Sequential Circuits MIDI interface you are in luck. Software for the Commodore ranges from the Studio 1 package which allows 16 sequences over 8 tracks: 16 MIDI channels per track; step time and real time entry; sequence appending track merging; live solo and mute controls; tape sync; digital delay; auto correction; auto punch–in's and out's; internal, external and MIDI clocks; 14 velocity settings per track; interactive velociity controls; program; pitch and modulation wheel editing, plus after touch editing! Within the program there is a 24 segment Cut and Paste Song mode with four song sets plus a transposing song mode to save on memory. Not bad – eh?

Syntech do have a MIDI-Studio version of the Studio 1 which is designed for the MIDI beginner or MIDI curious. A very nice additon to the Studio 1 is the Song Player. As the C64 is so limited in the number of MIDI events and due to the slow access time of the 1541, Syntech have developed the song player to auto load pre-arranged tracks which have been defined by the Studio 1 sequencer. Twenty-eight songs can be stored allowing an entire evenings songs to be ready in memory with full editing, sequence looping for solos and enhanced playback. At last the 'live' musician has a chance to use low cost computers within his set-up.

Two other programs from Syntech include the DX-TX Master which is a programming tool for the Yamaha DX-TX series of synthesizers. It includes 320 library sounds and allows easy editing and storage. You can direct the sounds to any module that you might be using, there are three editing screens and three sounds can be triggered from the computer keypad whilst editing, four separate printouts of programs and parameters are available. There is also an additional disk of 320 sounds available. Last but not least is the Keyboard Controller which allows one master keyboard to slave MIDI instruments on any of the 16 MIDI channels. Three levels of operation are provided to offer fast and easy information transfer to 16 different MIDI units. Syntech have a vast range of new product in development and no doubt we will see them in the UK in the very near future.

"Extended use of Hardware"

From the designers of the Digidrum come several new ideas which will be available from Syndromic Music. The TRON Digidrum 3 version has now been released which extends the use of the hardware. The new package, available on disk and cassette, features the same programming software as version 2 but now with an Editor section. This editor allows you to copy, swap and even mix samples together, change the volume and envelope the sound plus giving you visual block graphs of the envelope and clipping rates. The editor feature allows you store these changes directly to disk and then go onto the sequencer side of the package with the sounds still retained in memory.

The program disk now has four complete kits on it, all of the individual samples may be loaded off singly and then re-—entered into another kit.

The extra soundset disk V2 now contains 40 samples both single and complete kits this being the previous soundset 1. A new soundset V3 is in preparation.

A MIDI package is also available allowing the Digidrum user to play the sound samples 'live' via a suitable MIDI interface and MIDI equipped keyboard or drum pads.

I was unable to see the cassette versions of these programs do there may be some differences between the disk and cassette versions.

The prices of the TRON Digidrum 3 in the UK is now £79.99, Soundset V2 – £17.99 and the MIDI software should be £17.99 also. For those people who already have the Digidrum they can get the version 3 program for £14.99. All these prices include VAT and postage and packing.

I use the company name TRON as due to a legal dispute in Holland the name of the product is now TRON Digidrum and not Syntron Digidrum.

"German Software"

From a German firm comes the first software for the Korg DW-8000 and EX-8000 synthesizers. PA Decoder have launched two new programs. The Sound Design and the Dump program (an apt name!) allow complete sound banks to be loaded and stored, 85 banks each containing 32 sounds may be loaded in, and it is capable of loading and dumping single sounds. The programming is done via three operating pages plus a useful help page (or it will be useful when written in English!) and the waveforms produced may be graphically represented on screen.

Rittor Music Europe Ltd who established themselves in the UK last year have begun to make progress in the UK market place with a variety of songbooks, instruction books and cassettes, plus the range of Passport MIDI software. They also handle the Broderbund Music Shop which uses the Passport MIDI interface for the C64/128. All the software is disk based as is most serious music software and applications.

The latest software package from Passport is called the Master Tracks. This program features three main options: real time, step time and song mode. In the real time mode you get a 16 track sequencer with solo/mute on each track, real time punch in/out with trim functions and fast forward and rewind. The MIDI Thru lets you hear any of 16 different sound sources from your master keyboard and there are master clock syncs available to and from MIDI, an internal clock and tape. A nice function here for you home recording fans is an advanced tape sync which writes a variable tempo pulse to tape. This reads tempo changes very accurately and allows synchronization to visual events. The Master Tracks records pitchbend, velocity

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"The Final Cartridge" is a good product in many ways. **BUT** when it comes to making backups it is just not in the same class as "Freeze Frame". Another major drawback, not made clear by advertising is that saved programs can **ONLY be reloaded with the cartridge in situ.** (The use of the term "Freeze Frame" in their adverts is merely an attempt to benefit from the success and advertising of our product.)

"UPC1" has it's uses but in it's current form **cannot be taken seriously** as competition for "Freeze Frame"

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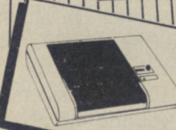

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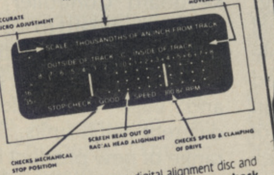
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The program includes a digital alignment disc and software which allows you to **accurately check and correct** disc drive alignment. The instruction booklet is **very detailed**. Also includes quiet drive stops to **stop** that "hammering" thus preventing further problems.

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Incorporates Centronics Printer software (user port) **with CBM graphics** capability. See "Commodore Connexion" for suitable lead.

A RESET switch is fitted. (We have found this to be "unstoppable", it also preserves the tape buffer.)

NO MEMORY IS USED by this cartridge. It is totally "transparent" and uses special switching techniques.

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and aftertouch and has over 8000 memory events without loops or repeats.

The step time feature allows you to step input and edit pitch, duration, velocity, articulation and tempo. The real time files may be converted to step time files for visual editing plus there are cut, copy and paste editing facilities plus a high resolution duration control which lets you do complex track shifting, MIDI delay and phrasing effects. The song mode allows you to step assemble songs using full 16 channel sequences created in step time or real time. 256 different sequences can be combined using any of 256 steps.

There is a scroll mode allowing you to visually scroll through sequences during editing. The song mode also offers solo/mute on individual sequence tracks for efficient use of tape sync with a limited number of synthesizers.

"Further Support for 64"

The Master Tracks will retail at £199.95 and the hardware for C64 will set you back a further £109.95 to £149.95 depending whether you require tape sync or not. Another company who see to be supporting the C64 is Steinberg Research. Based in the USA and now distributed by the Oxford Synthesizer Company who also distribute the Oscar Synthesizer the Steinberg software and interface is gaining recognition in the market place.

The interface syncs to and from MIDI, tape and drum units and has MIDI In/ 2xMIDI Out/MIDI Thru plus start/stop for Roland drum machines.

The range of software is quite impressive with a Pro 16 Sequencer capable of 64 sequence patterns which may have up to 64 measures with 256 steps in a sequence chain. An overdub facility is available for every track as is auto-correct or quantizing. The software can record 8000 notes and the program has a real time clock and complete help pages. This package may be linked to the TNS software which takes the music recorded on the Pro 16 and transcribes it to the screen with full auto-correction. The TNS supports a music editor and properly handles ties, flags, rests, split-points, enharmonics and any time and key signature. Prompt switching betwen the Pro 16 and TNS allows you to hear what you have just edited. The TNS also supports print out on a dot-matrix or plotted printer. Both packages are disk or Eprom based.

Sound editing software is available from the Yamah DX7, Casio CZ series and Korg DW 6000 synthesizers.

So that's about it from the Frankfurt show! There will be more software developments coming out for the C64, but the 128 MIDI software will begin to appear shortly as will the Amiga.

"Amiga Music Software"

Current news on the Amiga and music software is mainly from the States as they have had this computer for some months. Electronic Arts who have a Delux Music Construction Set for the Mac are doing a MIDI version for the Amiga. Hopefully this will be directly compatible with the Amiga version of Texture from Cherry Lane, the former package acting as notation software.

Concertcraft which is also from Cherry Lane is a four voice accompaniment program which can increase or decrease its tempo in time with a live performance. Musicraft is a four part composition program combined with an extensive synthesis system using the Amiga's internal sound generation. You might have seen the prototype of this at the Which Computer show. There will also be a 49 note keyboard with full size keys that may be used to control and play the music potential from the Amiga.

Voice editing software from Mimetics allows the DX/TX/RX/SX series from Yamaha to be controlled, particularly the system exclusive commands. The reason why some computers have not been adapted to MIDI is for this very reason. The Yamaha DX7, for example, has around 145 exclusive formats. Mimetics are also launching a program called Soundscape which includes MIDI, sampling, modular multi-track sequencing and other peripherals such as a keyboard, sampler and pitch follower for the Amiga which will bring its features in line with music performance and let us hope the educational enviroment.

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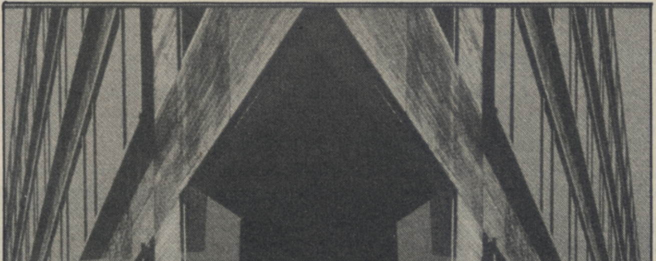
MUSIC MUSIC MUSIC

What's Up Doc?

From a secret laboratory deep in the heart of the USA, Dr. T creates a MIDI software package for the Commodore 64. Ian Waugh dons his white coat, sterilised face-mask and rubber gloves and reclines on the couch to dictate this report.



"You see, Doc, it's like this... I've seen MIDI sequencers for recording music in real-time but – this is confidential, isn't it? – I can't play the hard bits. The twiddly bits, you know: funky bass runs and that sort of thing. I need something which will let me record in step-time, too."

"Relax, son. Here, try this new sequencer from Dr. T. It offers real-time and step-time recording all in one package."

"Gee, I don't know how to thank you, Doc."

"That's okay, son, I'll send you the bill."

Real-time and step-time recording in one package is not very common and some software requires the user to save and load files when changing from one to the other. None of that with Mr. T. Another bonus is the fact that the software will operate with a Passport or Sequential MIDI interface and it may work with other interfaces, too. In case you wish to maintain brand loyalty, however, Dr. T. do produce their own.

The manual is 100 pages of help and information. It begins with real-time sequencing and progresses from there to step-time and then to explaining other features of the system. You very soon realise just how many features this software has.

"Each Note Assigned to Separate Computer Key"

The first menu you are presented with initialises the program with the main options which will be used throughout that recording session. These include various clock settings to enable you to link up with external drum machines. Real-time Transpose Options let you alter not only pitch duration but note velocity, too. It may require a mental shift to think of transposing the latter but it makes sense. Then there are the step-time input values. In step-time entry, there are 15 values for note duration, 15 for separation and six for note velocity. Each value is assigned to a separate computer key. All the initialisation values have sensible defaults and you will generally pass straight onto the next section.

There are three ways of entering notes. First, from the real-time screen the Align feature makes sure you record a whole number of bars. The metronome starts when you begin to play but you can get a count in if required. f7 causes the piece to play and repeat.

The Step-Time screen shows the keys selected during Initialization. To enter a note, select the parameters from the screen and press a key on the keyboard. You enter chords by holding a key and pressing others. Rests are programmed with f5 and combinations of two of the menu options can be entered with a couple of key presses. You soon pick it up.

Thirdly, you can enter notes from the computer keyboard. This is a little more involved as each note requires the following information: Time, Channel, Type, Note, Velocity and Duration. The computer gives you the Event number and the Measure and Step at which the event takes place.

Time is the number of clock steps which elapse since the last event (from 0 to 65535) but abbreviations can be used to make entry easier, eg. W for a whole note and A for the last note entered. Channel is the MIDI channel and you can enter different channels throughout the sequence. Type refers to a type of event. There are seven MIDI events: note on, note off, control change, program change, after-touch, pitchbend and * – a single byte event which is useful for system exclusive messages. There are two non-MIDI events: deleted event or rest and Sequence Start Event which would be any sequence key (A-Z or 1-9). We haven't covered sequences yet so here goes.

"The Program Hinges Around Sequences"

A sequence, as its name implies, is a single recording. Each is 'named' by pressing a key on the keyboard (A-Z or 1-9). You are warned if something has been recorded there. You then select real – or step-time recording and off you go. You can playback a sequence while you record another and there are five other options which affect the way information is recorded and stored. You can mute sequences and alter tempo and pitch during playback.

A Control Sequence can be made which will control the playing of other sequences, including pitch and velocity transposition and a variable number of repeats.

The Edit Mode prompts for a sequence and then lists 14 editing options including: list, copy, move, insert and delete events and transpose sequences. You can get down to single events if you wish. Rather tedious for most of us, but it's there for the MIDI buffs.

There are even more interesting options such as Auto-Correct to tidy your timing and Compress/Expand which lets you to change drum machines while maintaining sync. It will also alter the speed of a sequence relative to others. Time Reverse will play a sequence backwards and Auto Channel Assign re-assigns each consecutive event to a different MIDI channel. Some pretty weird effects are possible here at the touch of a key or two.

The manual includes lots of other goodies, too: more on Control Sequences, creating riffs you can play along with, constructing songs, doubling parts, creating echo, storing and changing presets and storing drum patterns. It also contains general MIDI information, several pages on trouble shooting and application notes about Casio, Korg, Voyetra and Yamaha's synths and drum machines. And it has a good index.

"Some Minor Irritations"

There were a few baddies to go with the goodies, though. The disk can only be catalogued from BASIC and erases any recorded sequences. Other minor irritations include the way some of the screens are presented, and the odd way you quit one or two of the menu screens – well, I thought it odd. A bit more on-screen info about current options would have been nice, too. Most surprising was the way some errors caused the program to stop. You could generally continue quite easily with no ill effects, but a strange occurance in such a piece of software.

I was left with the feeling at the back of my mind that use and presentation could have been improved, but perhaps my idea of ergonimics is not everyone's.

Real-and step-time sequencing together is great. The real-time is particularly easy to use and, once you get used to it, step-time is simple, too. The overall impression of the package is one of a multitude of features, many not found in any other software anywhere. There really has not been space in this review to even mention them all. It's competatively priced and if you like it, other Dr. T software includes library programs for Yamaha's DX and Casio's CZ synths.

"You see, Doc, I've found this terrific MIDI sequencing package with loads of features. It seems to have everything I need in a piece of MIDI software."

"So what's your problem, son?"

"How do I plug it into my drum kit?"

Dr. T's Keyboard Controlled Sequencer cost £125. It is distributed soley through Take Note Services, 112 – 126 Camden High Street, London NW1 ONB. Tel: 01-267 6813.

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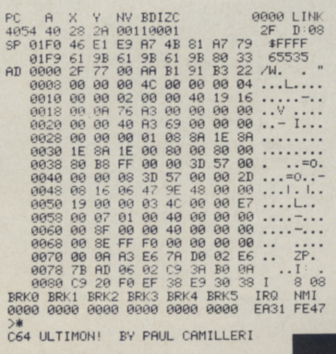
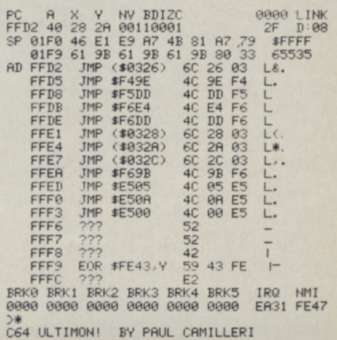
LIST OF COMMANDS
A – Alter memory.
B – Break point set.
C – Compare two blocks of memory.
D – Disassemble memory.
E – Examine memory contents.
F – Fill memory.
FM – Format a diskette.
G – Go at address.
GP – Go at program counter.
I – Basic Interpreter on/off.
J – Jump to subroutine at address.
JP – Jump to subroutine at PC.
L – Locate a string of bytes.
M – Move a block of memory.
P – Alter processor status register.
Q – Quit out of Ultimon!
R – Read from device.
S – Single step.
T – Trace through memory.
U – Display update mode.
W – Write to device.
X – One byte read.
– – Pop stack.
= – Push stack.
P – Dump screen to printer.
S – Cartridge on/off.
Alter 6502 registers
Link device type select
Link device number select

Note There are more than 60 commands to ULTIMON!

TWO SCREENS FROM ULTIMON!



```
PC   A  X  Y  NV BDIZC          0000 LINK
4054 40 28 2A 00110001            2F  D:08
SP 01F0 46 E1 E9 A7 4B 81 A7 79  $FFFF
   01F9 61 9B 61 9B 61 9B 80 33  65535
AD 0000 2F 77 00 AA B1 91 B3 22 /W.  . "
   0008 00 00 00 4C 00 00 00 04 ...L....
   0010 00 00 02 00 00 40 19 16 .....-..
   0018 00 0A 76 A3 00 00 00 00 ..V ....
   0020 00 00 40 A3 69 00 00 00 ..- I...
   0028 00 00 00 01 08 8A 1E 8A ........
   0030 1E 8A 1E 00 80 00 80 00 ........
   0038 80 B8 FF 00 00 3D 57 00 .  ..=O.
   0040 00 00 08 3D 57 00 00 2D ...=O..-
   0048 08 16 06 47 9E 48 00 00 ...|.|..
   0050 19 00 00 03 4C 00 00 E7 ....L..
   0058 00 07 01 00 40 00 00 00 ....-...
   0060 00 8F 00 00 40 00 00 00 ....-...
   0068 00 8E FF F0 00 00 00 00 ..  ....
   0070 00 0A A3 E6 7A D0 02 E6 ..  ZP.
   0078 7B AD 06 02 C9 3A B0 0A   ..I: .
   0080 C9 20 F0 EF 38 E9 30 38 I   8 08
BRK0 BRK1 BRK2 BRK3 BRK4 BRK5  IRQ  NMI
0000 0000 0000 0000 0000 0000  EA31 FE47
>*
C64 ULTIMON!  BY PAUL CAMILLERI
```



```
PC   A  X  Y  NV BDIZC          0000 LINK
FFD2 40 28 2A 00110001            2F  D:08
SP 01F0 46 E1 E9 A7 4B 81 A7 ,79  $FFFF
   01F9 61 9B 61 9B 61 9B 80 33  65535
AD FFD2  JMP ($0326)  6C 26 03  L&.
   FFD5  JMP $F49E    4C 9E F4  L.
   FFD8  JMP $F5DD    4C DD F5  L
   FFDB  JMP $F6E4    4C E4 F6  L
   FFDE  JMP $F6DD    4C DD F6  L
   FFE1  JMP ($0328)  6C 28 03  L(.
   FFE4  JMP ($032A)  6C 2A 03  L*.
   FFE7  JMP ($032C)  6C 2C 03  L,.
   FFEA  JMP $F69B    4C 9B F6  L.
   FFED  JMP $E505    4C 05 E5  L.
   FFF0  JMP $E50A    4C 0A E5  L.
   FFF3  JMP $E500    4C 00 E5  L.
   FFF6  ???          52        _
   FFF7  ???          52        _
   FFF8  ???          42        |
   FFF9  EOR $FE43,Y  59 43 FE   |-
   FFFC  ???          E2
BRK0 BRK1 BRK2 BRK3 BRK4 BRK5  IRQ  NMI
0000 0000 0000 0000 0000 0000  EA31 FE47
>*
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```

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Your EXPAND-ING Musical World

Ian Waugh plugs into some new music hardware gasps at the sounds which issue from his computer. His feet might do the walking but his fingers do the talking.

Sound Expander
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Sound Studio
Synthesizer & Home Recording Studio
MUSIC EXPANSION SYSTEM FOR THE COMMODORE 64 AND 128
Includes Full Size 5 Octave Music Keyboard.
Requires Commodore 64 or 128 Computer.
commodore

Commodore and Music Sales are certainly doing their utmost to bring music to 64 (and 128) owners and their Music Expansion System (at £149.99) is one of the lastest items of musicware (is that a new word?) to emerge from their R&D department. The system comprises a five-octave keyboard – twice as useful as a four-octave one but oh for pitch-bend or modulation wheel – a Sound Studio program and a Sound Expander FM Synthesis cartridge. All software was supplied on tape although it is available on disk and the items are available separately if you want to build up your system slowly.

The Sound Expander plugs into the cartridge port and the keyboard plugs into the Sound Expander but you can also play the QWERTY keys, preferably with one of the mini plastic keyboard overlays. The Sound Studio will also work with the large keyboard if the Expander is plugged in. Super!

We'll start with the Sound Studio. It consists of two programs: a synthesiser and an Editor. The synthesiser is one of those programs which lets you fiddle about with SID – and very comprehensive it is, too. The User's Guide includes a brief run down of sound, pitch, timbre, volume, etc., and goes on to explain SID's more interesting features such as ring modulation and synchronisation. Vibrato and portamento get a mention, too, along with the filter and how to sweep it (I never knew it got dirty).

Examples of the different function are demonstrated by ACTION headings in the Guide and graphic displays of the parameters should help even the musical novice get into the package quite easily. It is worth mentioning that sounds can be given attributes which can not be programmed directly into SID. For example, portamento requires the pitch to slide between two notes, something you can not achieve with a single POKE. This, and other niceties such as filter sweeping make single sounds more interesting. The program contains 60 presets so you have plenty of material with which to experiment.

Creating sounds is one thing but putting them to practical use is another. This is where the Sound Editor comes in. It enables you to create multitrack arrangements of up to three tracks with a different sound on each track. The software is also MIDI compatible and if you have a MIDI interface you can record up to six tracks to be played back through MIDI-equipped synthesisers. Casio's CZ101 and CZ100 synths are useful here as they can play back four lines at once. The MIDI information the program handles is fairly simple so on the one hand, while you can use the program without knowing anything about MIDI, on the other, you can't get at all the exotica of the MIDI protocol. The program isn't aimed at the MIDI buff, however, but it lets the ordinary user see what MIDI can achieve.

Music can be entered in real-time or step-time and then edited in step-time. Such editing is not even found in all dedicated MIDI software. The editing system is quite simple and easy to use, a big plus for newcomers to the world of computerised music.

The Sound Studio will give anyone a good grounding in synthesis and recording and they will then be dying to plug in to the Expander.

The Sound Expander does not use SID, instead it produces its own sounds using FM synthesis. This is a method of creating sounds developed by Yamaha and incorporated in their famous DX synthesisers. FM is special because it is able to reproduce the characteristics of acoustic instruments with amazing clarity and accuracy. You can channel the sound through your TV as usual but for best results plug it into your hi-fi.

With the system up and running, the first sound to greet your ears is a vibrophone – bright and clear. Let's hear more. There are 12 fantastic voices in all with another 12 on the disk version. An ensemble option thickens the strings (like gravy granules) and beefs up the brass. My only complaint is that you can not alter the existing sounds other than changing what can best be described as brightness. However, a Voice Editing program is on the way which will put that right.

There are a number of Setup options which include a keyboard split (and you can assinging a different voice and octave range to the lower half), one finger chords and a memory facility. You can also alter the border colour and set it to flash in time to the rhythm from the Riff Machine.

The Riff Machine (I thought you'd never ask) consists of a series of riffs – well, what did you expect? They are pre-programmed – so you can't do much but sit back and listen to them but what sounds they are. There are three riff types on tape and more on the disk. They produce quite complex rhythmic patterns complete with drums, bass and lead line. There are twelve different patterns in each riff and you can select these by pressing one of twelve keys. In this way you can program a sequence of patterns as they are all cleverly constructed so any one can follow any other.

The Country banjos – don't let the name put you off – is particularly excellent as are the disco riffs, too. Unfortunately, you can't play along with them. Another program in the offing, an FM Composer package, will let you arrange your own riffs so that's eagerly awaited, too.

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Office Mate

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General System Overview

The Gemini cash book package for the Commodore 64/128 microcomputer is designed for a hardware system consisting of:

1. Commodore 64/128 microcomputer.
2. 80 column printer.
3. Cassette or disk data storage.

Please note that running the program on disk will not change the way that the program works, but you will have the benefit of far greater speed and reliability for the loading and saving of files that a disk system provides.

There is a total of 199 nominal accounts, a large number of which may be defined by the user. You may have up to four cash control accounts, six bank control accounts, one sales ledger and one purchase ledger control account.

The program will store a data file consisting of:

1. The account titles.
2. The current cumulative balance on each account (debit or credit).
3. The net movement on each account for every month of the year.
4. VAT net sales and net payments figures, which are automatically created and maintained by the program.

This same data file is used by the FINAL ACCOUNTS program. The 'VAT FILE' which accompanies this package is designed primarily for those users on the Retailers special VAT schemes.

The main features of the CASH BOOK program are as follows:

1. Double entry routines for transactions through the cash/bank accounts and sales/purchase ledger control accounts.
2. Journal facility for the initial set up of accounts, or for adjustments to any of the accounts.
3. The facility to produce the following screened or printed reports:
   (a) Listing of all the nominal account titles.
   (b) Monthly transaction summaries.
   (c) A trial balance whenever required.
   (d) Screen VAT memo account balances (sales/net purchases, and VAT accounts).
   (e) A batch printing facility which provides details of all the transactions entered in the current run of the program.
4. The facility to extract regular management information such as cash/bank balances, debtors and creditors, sales, overheads, etc.
5. The program interfaces with the Gemini FINAL - ACCOUNTS program to enable Trading and Profit and Loss accounts and Balance Sheet to be produced whenever required. Comparative or budget figures can be shown alongside the actual figures using this program.
6. Screen prompts throughout the program to facilitate ease of use.
7. Storage of VAT information to assist in the preparation of periodic VAT returns.
8. Error trapping routines to minimise input errors.
9. The facility to handle the financial transactions of sole traders, partnerships, limited companies, clubs, etc.

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MOVIE SCENE

COMMANDO (18)

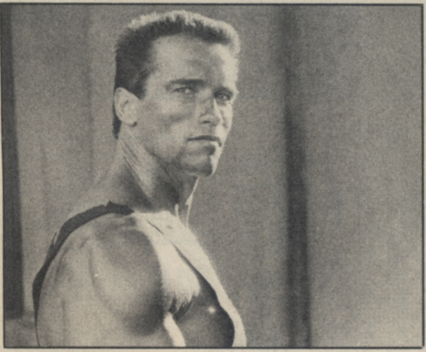
At 19 Arnie Schwarzenegger (that's the one and only time I'm spelling that!) went to this first body-building competition, and won. From then on he seems to have gone from strength to strength (sic! Ed), culminating in this show of undiluted acting talent....-COMMANDO!

I must say that it is very unlikely that Arnie will ever get many Oscars – however in this film he is capable of seeing that to give any credibility to the role he is attempting to play, he must see the funny side of things.

The storyline is pretty standard; general superhero Colonel John Matrix seems perfectly happy in his country hideaway, not a care in the world. Surprise Surprise! General Arius, a truly evil man grabs Arnie's daughter, and will only return her if our hero agrees to murder a democratically elected president!

Well, 90 minutes and a happy ending later I felt that this film was, in a tongue in cheek manner, good fun. The screenplay (written by the same man who wrote 48 Hours – Eddie Murphy's first film) is excellent and exploits the ridiculousness of Arnie's Austrian accent.

If you liked Rambo, but prefer something funnier, then Commando's for you – as Arnie puts it..."LET'S PARTY!!". **FJ**



DREAMCHILD (PG)

It's 1932 and Alice Hargreaves, immortalised in Lewis Carroll's "Alice in Wonderland" arrives in a real rather than imaginary Wonderland.

Now 80 years old and voyaging to New York for the Carroll Centenary celebrations, the prim doyen of a fading age meets head on with the jazz age, the depression, showbiz and brash, modern America. She is now as fantastic a creature as any of Carroll's inventions, the fairy tale come to life in America's imagination and the unwilling focus of its agressive curiosity. She finds the crass scrutiny of the press bizarre – curiouser and curiouser. But though initially overwhelmed, she is soon seduced by the allure of power, attention ... and money!

In her bewilderment at what is expected of her and what it all means, she is forced to re-examine buried childhood memories ... with disturbing results. It is only now that she realises the true erotic nature of Carroll's 'paternal' interest in her.

In beautifully shot flashback sequences, there are subtle hints of childish allure and restrained adult desire. Amelia Shankley gives a wonderful performance as the wilful young Alice, teasingly callous yet naively unaware of her true power.

The film's interlacing of the enchanting and the subtly menacing is best portrayed not in the wild hoardes of the New York press, or the subdued longings of Ian Holme's Carroll, but in the wonderful creations from Jim Henson's Creature Shop. The Mad Hatter, the March Hare etc. are all amusing and original, yet with a barely hidden threatening edge.

A visually inventive and stylish film, Dreamchild is also graced with Dennis Potters witty dialogue and exceptional acting, notably Coral Browne's aged and tetchy Alice.

Highly recommended.

Defence of the Realm (PG)

We all, at least in weak moments, believe in the conspiracy theory of history. THEY combine and are out to get us – if THEY can. Gabriel Byrne, who plays the journalist hero of this clever, often tense story of what THEY – in this case the British Government and its security services – will do if you get in their way, does not start as anything but the conventional, trench-coated newshound. But when he is set up to expose a fake sex scandal designed to stop an Opposition MP asking awkward questions and then his gin-swilling friend and mentor (brilliantly acted by Denholm Elliot) is found dead – probably murdered – he takes a more personal interest in the recent red alert at an American airbase in the UK where atomic bombs are stored.

The film, shot in a hard, documentary style, borrows an acute sense of paranoia from a similar and even better film, Alan Pakula's "Parallax View". Its twists are well-plotted and the small parts uniformly well-played.

It portrays the governing classes as totally ruthless but oh so smooth. Would, however, a "democratic" government involve itself in framing politicians and murdering journalists to cover up its shameful secrets? Well, stranger things have happened, and in the not-so-distant past, too.

A measure of the credibility of "Defence of the Realm" and our growing suspicion of authority and its self-justifying motives, is that when you leave the cinema, you look around with distinct unease. Is that someone lurking in the shadows? Have you paid all your taxes? Are you parked on a yellow line? Do you know something THEY don't want you to tell? At home, is your phone bugged and is there, perhaps, some infernal explosive device ticking your life away? If you are nervous of THEM and THEY could do to you, don't go near "Defence of the Realm". Hide your head under the pillow. Or in the sand. **AJ**

Felix Says........ Well well well! Who said I'd never last! Here I am again and if you promise not to tell, I've got some tales for you!!

Longer and longer.

Rumour has it that following some recent trends, a new Commodore magazine is about to be launched (or renamed?). Possibly titled "C16, Plus/4,64, 128, PC10 + 20, and Amiga UK Ltd. PLC." Although I wouldn't bother trying to purchase it yet!

Scoop!

Now I think this could go down in history as a first! Commodore have finished (or very nearly) the PAL version of the Amiga. Kickstart and Workbench V1.2 (designed specifically for the PAL system), have been given to certain lucky parties, as has the PAL chip. This is ahead of Commodore's schedules! Now about the software.......

Small but.....

As we all know it's quality not quantity that counts, so I would like to stem a few rumours that have been flying around. Firstly, I am in no way imperfect! A said person insinated that one of my hands has a defect, this was due to a childhood accident, nothing else!

Oops

Somewhere along the line I managed to misspell a couple of names when reporting on Activisions answer to Laurel and Hardy. Matin Gysh and Jock Davey seemed a little peeved at this so I promised to correct it this issue. OK boyz?

Home Sweet Home!

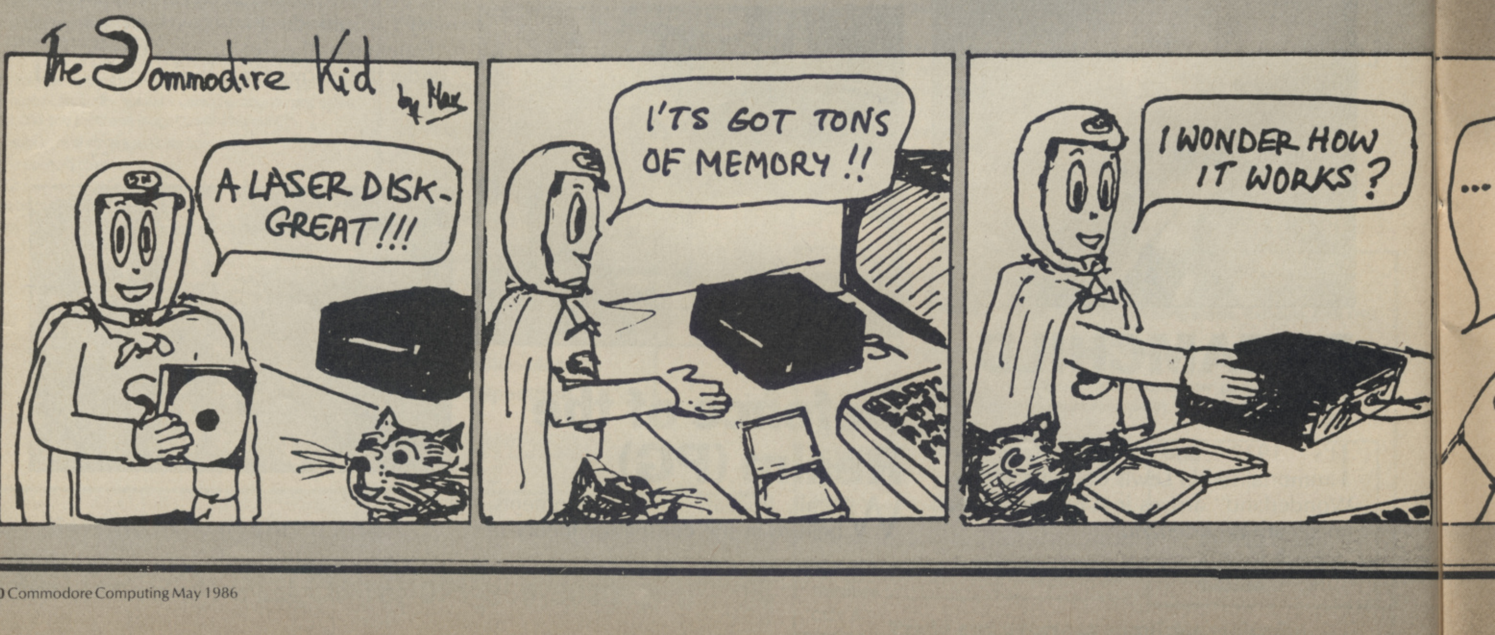
After quite a while speculation as to his future, Tony Crowther has gone back to doing what he's best at.... programming (what else?). After a split with Wizard, Tony has returned to his one time employers, Alligata – where he will be a full time games programmer. Let's hope his first release on his return to Alligata has nothing to do with trains!

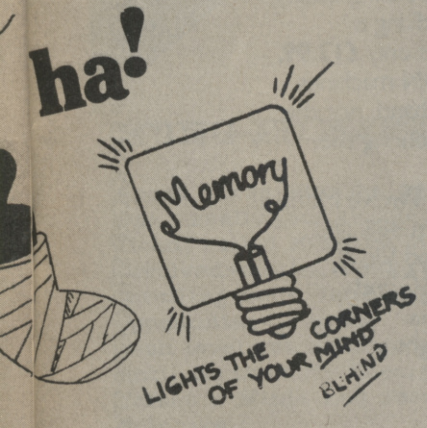
....Gulp

Now as we know, I am here only to speak the truth that others would rather have hidden. However, last month's stories seem to have gone a little close to the bone.... It has been a long time since I've been threatened, but last month I was informed that someone was going to break my legs. Now although I am only small, the threatner was tiny! Please, in future if angry, count to ten before phoning me; if very angry, a hundred!

Zzzzzz

Now I'm not sure but I've been told, that certain mags are a pain in the....asking (cXGP.86) questions while chatting to an industry colleague, I recently discovered that one magazine threatened them with no coverage if said software house did not send them a copy of a program. The dilemma for the software house was that it would rather demonstrate this program, anyway the magazine won – but I think they're getting a bit cocky. Wouldn't it have been the same had it been a major advertiser, US Gold perhaps?


The Commodire Kid
by Max
A LASER DISK- GREAT!!!
I'TS GOT TONS OF MEMORY !!
I WONDER HOW IT WORKS ?
...

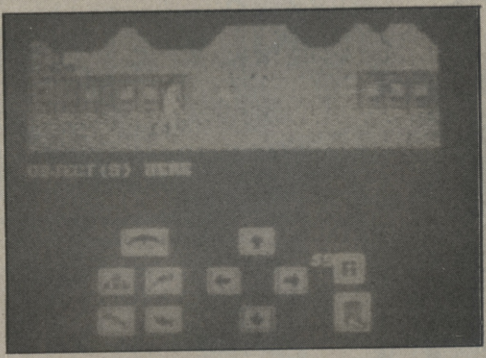

ha!
Memory
LIGHTS THE CORNERS OF YOUR MIND BEHIND

Dressed for the Occasion

A little bird has told us that people are asking whether it could be a coincidence, or that the close friend of Andrew 'Santa – Jimmy' Wright, Gary Penn, roving assistant Ed at Zzap, has recently been spotted wandering round his hometown of Ludlow (where dat?) in a nightie. Although known for his black (sic) dress sense (sic), this seems to be a new and disturbing development.

News

Just a few lines to tell you what game to expect to see reviewed in next issue. Firstly, you'll get a look at Martechs newest title "Geoff Capes Strongman", as well as a look at the latest title from Rino – 'Ark Pandora' (see screen shot above). US Gold's latest release will also be released, and I can see a few people who will gain great satisfaction from a game called 'Asylum'.



Hurdy Gurdy

Amazing, more response! I've just received a phone call from Sweden – home of all things wonderful (Abba, Volvo and Greve Graphics). Bengt Caroli (mad dog to his buddies) has told me some more news about their game, Soldier One. In extremely good English, he explains that the game was "a sort of three dee baattle game" which should "be finiisheed in abooout oonee weeek". I here that he is sorting out distribution at the moment . Watch this space.

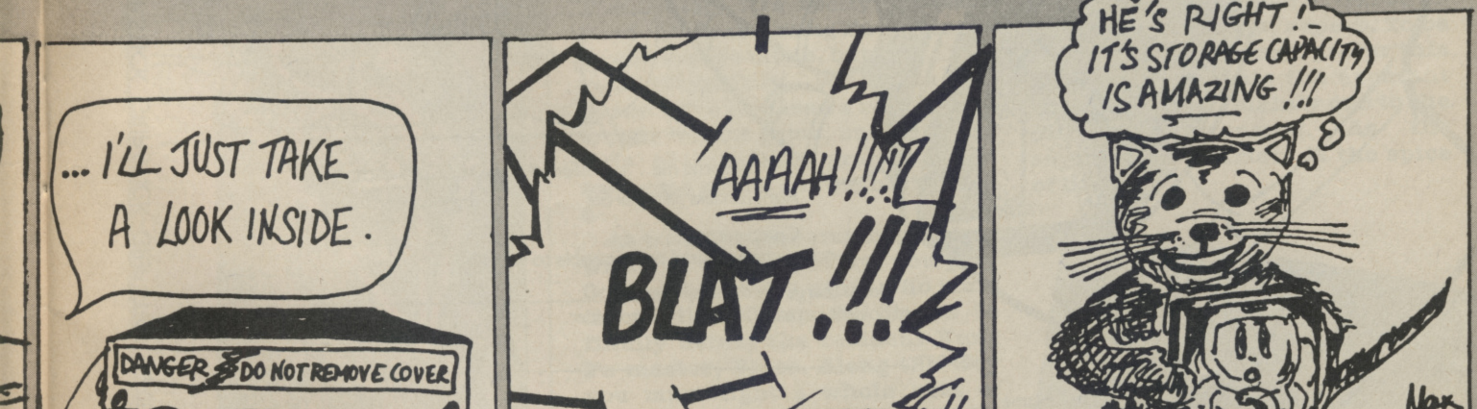
Whammy!

No this is nothing to do with the excellent album by that excellent band the B-52's. Whammy, as we all know, ryhmes with.... Sammy! Ye you guessed it, Samantha Fox, the world's most talented lady is about to be transferred onto computer form. Martech are all set to lunch Sam Fox's strip poker. I'm not really sure if I should say any more, for fear of being libelled, suffice to say I look forward to seeing the product, and I'll be practicing my cards!

That's all for this month folks, next month there'll be an exciting competition in which you can win some truly magic prizes. Byeeeeeee ee! from the world's most famous cat,

FELIX!

(And stop calling me Shirley!) Cont page 94.


... I'LL JUST TAKE A LOOK INSIDE.
DANGER DO NOT REMOVE COVER
AAAAH!!!!
BLAT!!!
MEWOW!!
HE'S RIGHT! IT'S STORAGE CAPACITY IS AMAZING!!!
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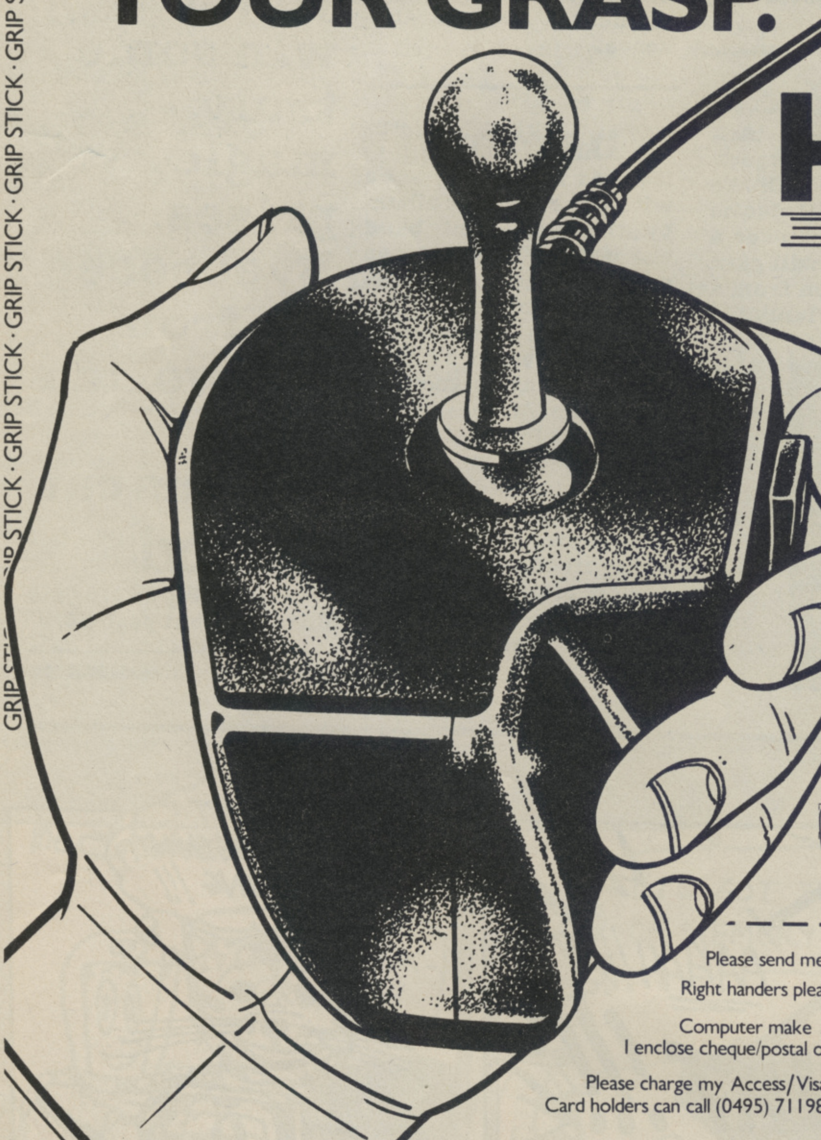

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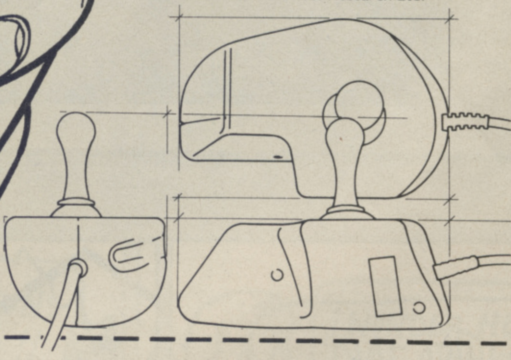

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CCI Rating:

IFFY

KUNG-FU MASTER

About three months ago, there was a really good arcade machine about, called Kung-Fu Master. It involved walking along a left/right scrolling floor, defeating various opponents. Having completed each level you must go up a floor until, on the fifth floor, you must defeat a Ninja and rescue your Princess.

US Gold have imported the 64 version of this game hoping to clean up on what's left of the Karate Game market. Personally I don't think they'll do it! Although the game is a fairly good copy of the arcade, the graphics and sound are a little too crude, and the game a little too easy (although the last Ninja certainly ain't!).

If you are a real afficianado of the arcade machine then this game will appeal to you, otherwise it is a case of 'Try before you buy'. Personally I would wait to see Ocean's Yie-Ar Kung Fu, or System 3's International Karate — then decide.

Overall, this game is fun, but in such a competitive market I'm not sure if it's worth ten quid!

Price:	£9.95
Graphics:	***
Sound:	***
Playability:	***
CCI Rating:	IFFY

Contact: US Gold, Unit 10, Parkway Industrial Estate, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020.

YIE-AR KUNG-FU MASTER

U.S. GOLD
KUNG-FU MASTER
KUNG-FU MASTER
Commodore 64/128

YIE AR KUNG FU

Two Ocean releases in one month, wow! Unquestionably the better of the two is Yie Ar. Although we have had quite a few attempts to better Exploding Fist, up until now no-one has really got very close. US Gold's Kung Fu Master is a good arcade clone, but lacks any real playability. With Yie Ar, Ocean have licensed a really good arcade karate game, and with the help of excellent graphics and awesome sound — brought it to the 64.

As with the Konami original, to which it sticks closely, you play Oolong, a budding ninja who must fight his way up the ranks to finally defeat the resident Kung Fu master, Blues. Along the way you must fight a whole host of martial arts experts who have an assortment of weaponry, ranging from throwing stars to Nun chukkas and swords.

As Oolong you have 16 different possible moves, each of which will need to be used expertly to defeat the wide variety of opponents you will meet.

The standard of animation is superb, as are the background scenes (although surprisingly there are only two); Galway's music is, as always, superb. To be honest I have to say I prefer this to the Fist, despite the apparent lack of realism, mainly due to the different opponents. As the saying goes: 'Variety is the spice of life'.

Price:	£8.95
Graphics:	****
Sound:	****
Playability:	****
CCI Rating:	MEGA

Contact: Imagine Software, 6 Central Street, Manchester M2 5NS. Tel: 061-834 3939

CCI Rating:

DODGY

COMIC BAKERY

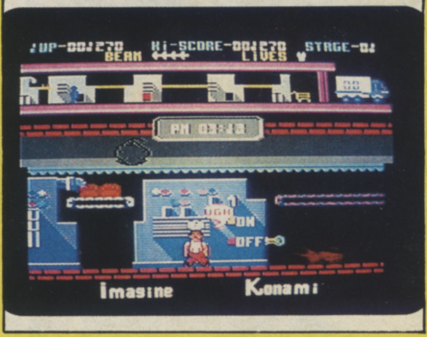
COMIC BAKERY

Imagine's second Konami release, Comic Bakery arrived recently. Excitedly I loaded the game, and after the now obligatory Martin Galway loading music (which is still superb), up came a graphically very pretty game, which I started playing with glee.

About an hour later, having played three games and scored over 120,000 on the last two, I sat back and wondered how anyone would release a game so easy as to be a joke.

The object of Comic Bakery is to take on the role of Joe the Baker. You must then try and ensure that as many loaves as possible escape the greedy Racoons and get to the childrens' tea party. To aid your task you have a gun that stuns the Racoons long enough for you to kick them away!

Again Martin Galway has produced the best part of the game, musically he has yet to produce a duff track (that I've heard). He personally rates it as his favourite, but I still prefer Rambo.



Overall the game is a disappointment to a games player. Younger children would, I'm sure, enjoy this game greatly, but otherwise I feel it lacks enough gameplay to keep anyone hooked for more than a couple of hours.

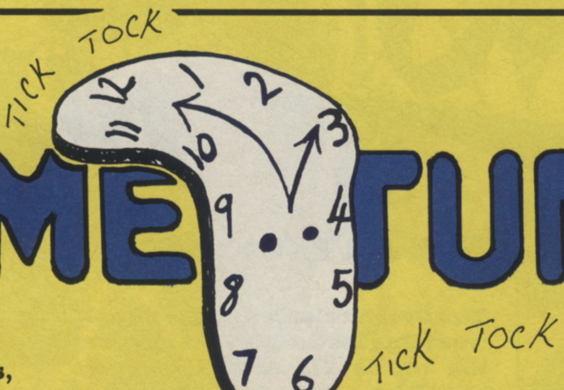
Imagine's next Konami releases are Mikie and Ping-Pong, so let's hope they're better!

Price: £8.95
Graphics: ***
Sound: ****
Playability: **
CCI Rating: DODGY

Contact: Imagine, 6 Central Street, Manchester M2 5NS. Tel: 061-834 3939.

CCI Rating:

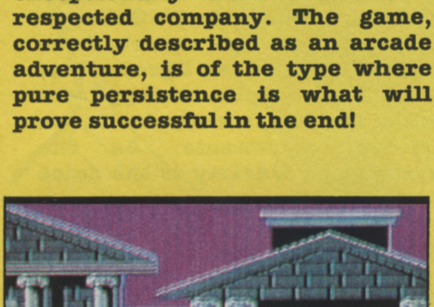
CRISP



TIME TUNNEL

TIME TUNNEL.

Unlike most of US Gold's imports, this one is not from an exceptionally well known and respected company. The game, correctly described as an arcade adventure, is of the type where pure persistence is what will prove successful in the end!



You play a little gnome like man, complete with bobble hat, who must (having successfully managed to fix his time machine) travel through the eight available time zones — collecting parts of a map which will eventually make him Gnome King.

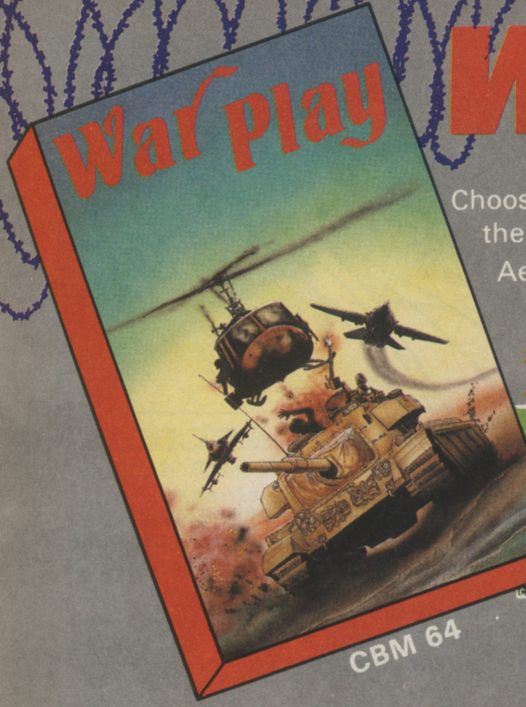
One thing this game isn't however is simple! Each time zone has red herrings as well as the piece you need, and a certain object from 9999 might be needed in 86BC!

Graphically Time Tunnel is nice, the movement of your man more than making up for the supposed 3-D, which leaves a lot to be desired! Thankfully it is not a multi-loading game, and thus playing it doesn't lack continuity.

All the different time zones have different backdrops, and the sound is quite fun (if a little monotonous? Ed). Overall this is a game for people who are sad watching Ultimate's demise, but are still arcventure freaks!

Price: £9.95 (tape).
£14.95 (disk).
Graphics: ***
Sound: ***
Playability: ***
CCI Rating: CRISP

Contact: US Gold, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020.



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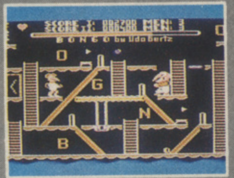

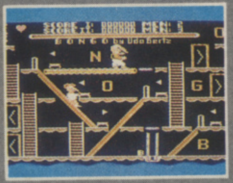

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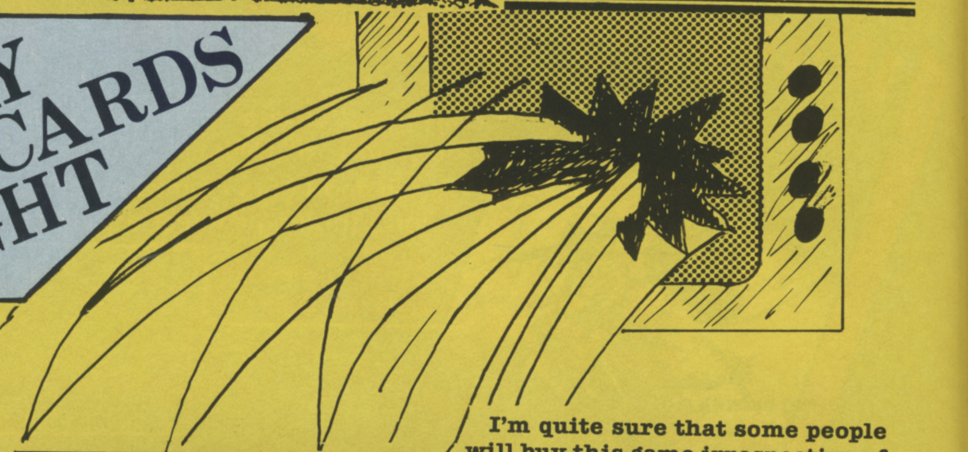
CCI Rating: DODGY

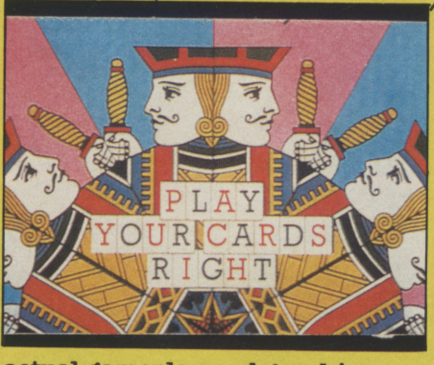
PLAY YOUR CARDS RIGHT



PLAY YOUR CARDS RIGHT

I suppose it was only a matter of time before someone wrote a game that had something to do with Bruce Forsyth aimed directly at the slightly older end of the market.

For some reason this man seems to be able to involve the crowd more than any other games show host (apart that is from 'The Price is Right'). Play Your Cards Right is a card game based on the television series of the same name, and for devotees of the game who have yet to be picked for the real thing it gives you a chance to sample the flavour of the game, though thankfully without the screaming crowds.

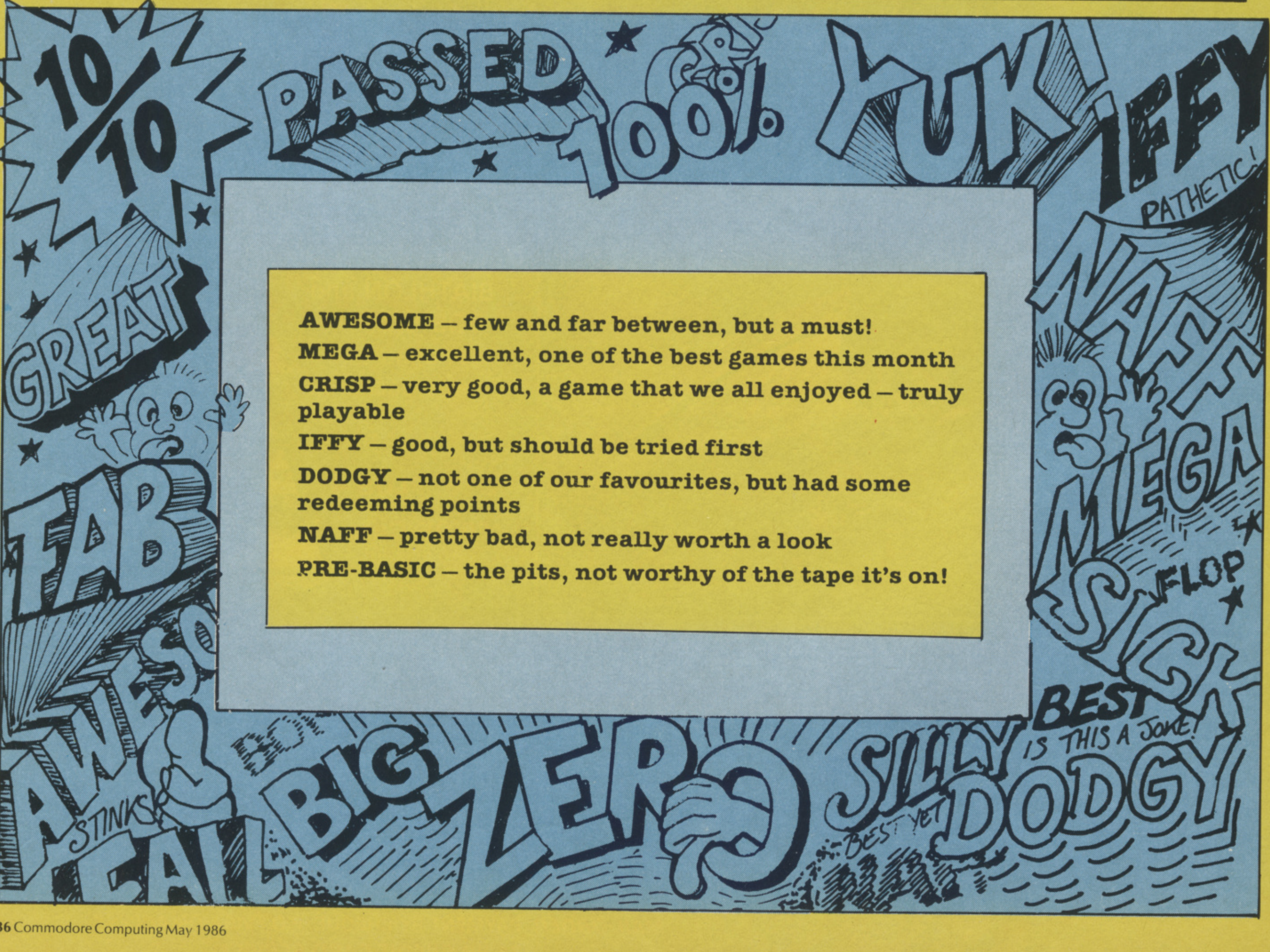


To be honest the game cannot have taken that long to write, the actual gameplay and graphics are simpler in many ways than the early card games, but it sticks faithfully to the programme, even down to the awful tune.

I'm quite sure that some people will buy this game irrespective of what I say, but I have to admit that although the questions get repetitive, it does keep you hooked – for a while. Basically, one for the Bruci afficianados.

Price:	£7.95
Graphics:	**
Sound:	**
Playability:	***
CCI Rating:	DODGY

Contact: Brittania Software, Unit M28, Cardiff Workshops, Lewis Road, Cardiff CF1 5EB. Tel: 0222 481135



AWESOME – few and far between, but a must!

MEGA – excellent, one of the best games this month

CRISP – very good, a game that we all enjoyed – truly playable

IFFY – good, but should be tried first

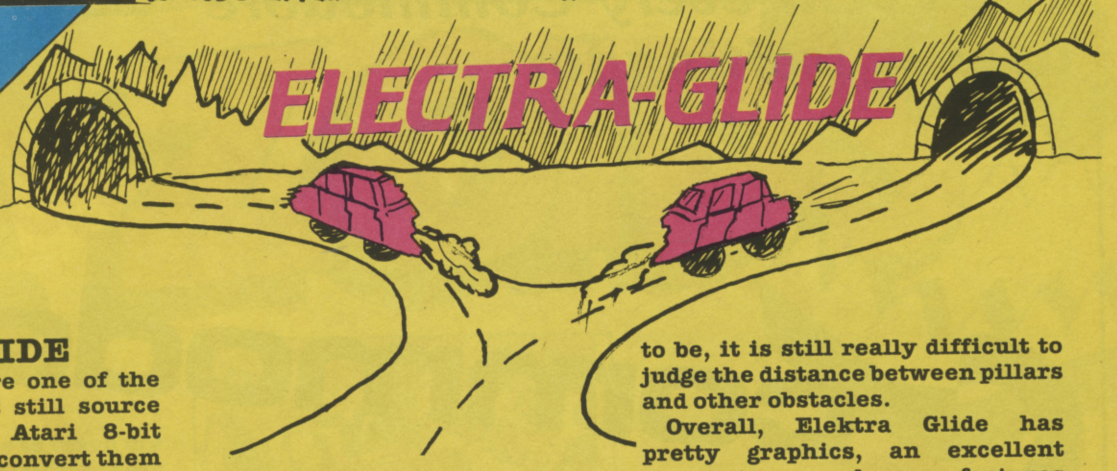
DODGY – not one of our favourites, but had some redeeming points

NAFF – pretty bad, not really worth a look

PRE-BASIC – the pits, not worthy of the tape it's on!

CCI Rating:

IFFY



ELEKTRA GLIDE

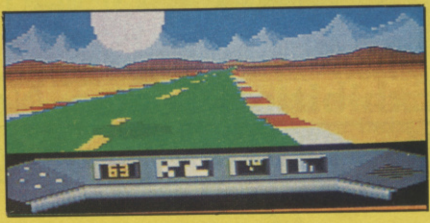
English Software are one of the few companies that still source programs on the Atari 8-bit computers and then convert them to the 64. Perhaps this explains why it has taken them so long to produce a decent racing game?

Unlike other racing games released recently, such as REVs; Elektra Glide does not try to produce a feel of complete reality, rather it attempts to include features not found elsewhere.

Graphically, Elektra Glide is really nice: the road is two-coloured and gives an excellent feel of movement, and the added dimensions such as 3-D obstacles and tunnels are all very pretty. Unfortunately, the gameplay leaves a little to be desired.

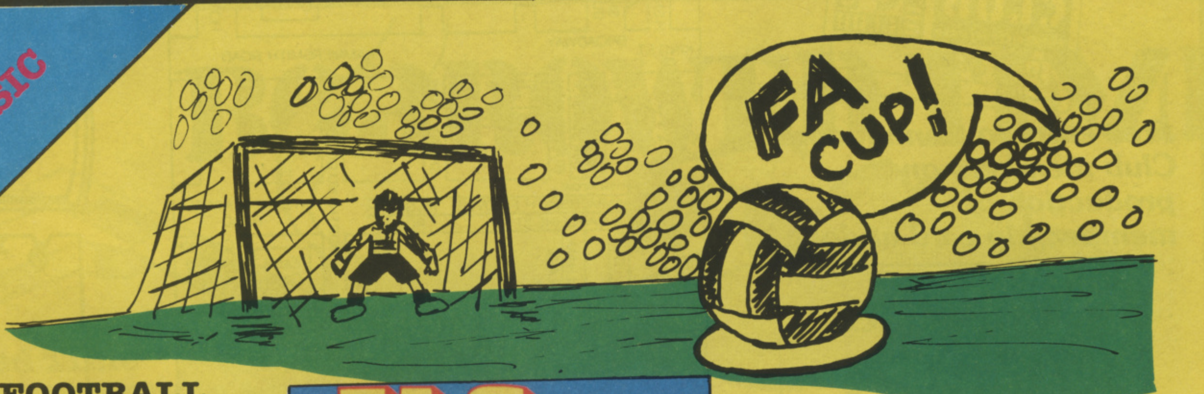
Although you can choose how sensitive you wish your joystick to be, it is still really difficult to judge the distance between pillars and other obstacles.

Overall, Elektra Glide has pretty graphics, an excellent theme tune, and some features that are very impressive. However my copy had small bugs in it (especially in the tunnels) — and really it could have been better.

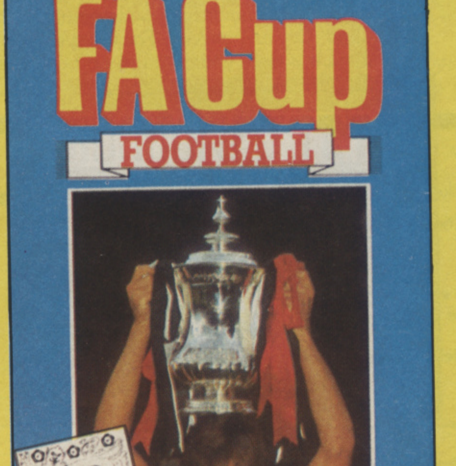


Price: £8.95 (cassette), £12.95 (diskette)
Graphics ★★★★
Sound ★★★
Playabiliity ★★
CCI Rating IFFY
Contact: English Software, 1 North Parade, Parsonage Gardens, Manchester M60 1BX Tel: 061-835 1358

PRE-BASIC



F.A CUP FOOTBALL



To be totally honest, this game could very easily have been one of my favourites of the month, but for three minor points; it's incredibly boring, the graphics and sound are awful, and it takes hours to load. Apart from that the games great.

Basically Virgin have managed to get F.A approval to produce a game that is meant to represent the thrills and excitement of the F.A trail. Personally I found it about as exciting as the open university (and at least that has a purpose).

As a Manchester United supporter I was glad to see that they always win (at least the 8 times I played as their team they did), but I doubt if Arsenal or Everton supporters would be quite as pleased.

There are no animated sections in the game, apart from a pathetic attempt when the draw is made. Overall this is the worst game I've seen this year, if you really can't find anything better to spend your 8.95 on (like four pairs of socks), give it to Band-Aid, just don't buy this game!

Price: £8.95
Graphics: Yes ZERO
Sound: ★
Playability: ★
CCI Rating: PRE-BASIC

Contact: Virgin Games, 2-4 Vernon Yard, Portobello Road, London W1. Tel: 01-727 8070

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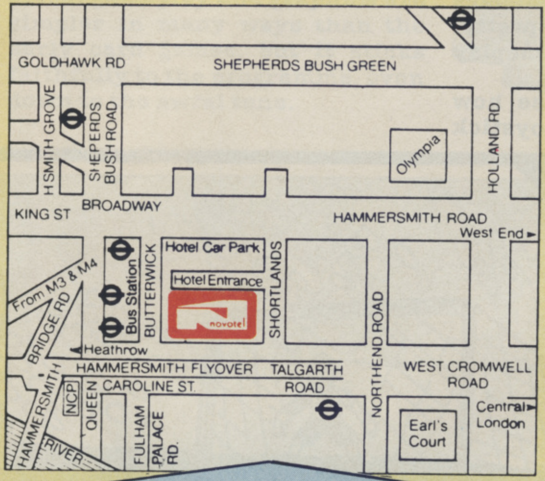

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MEGAREVIEW

CCI Rating: CRISP

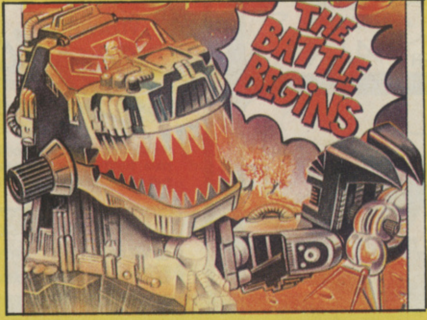
ZOIDS

ZOIDS

Martech's latest game to reach my desk is also, in my view, their best. Programmed by the Electronic Pencil Company (for more info read **FELIX!**) is based around the top selling range of childrens' toys.

In a rather Denton way, the game is controlled almost completely by icons, and even though all the screen is not used, the game is both atmospheric and exciting.

Subtitled – The Battle Begins, it involves a search by you, the sole humanoid from another galaxy (eeurchh!) for your craft so that, having pieced it back together, you can defeat Redhorn the Terrible.



The screen is divided into various sections, the centre showing you travelling around, and the rest of the screen being filled by eight icons. Other drop down menus can be activated either by attacking a Zoid or utilising some of the Icons.

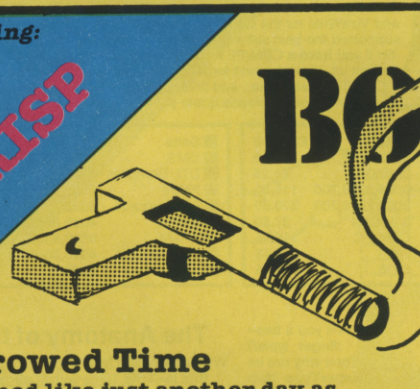
Again Martech have used a Rob Hubbard soundtrack, and again Rob Hubbard has come up with the goodies. This time he has shown that he is not limited to jolly tunes by producing one that suits the game perfectly - sombre, but good.

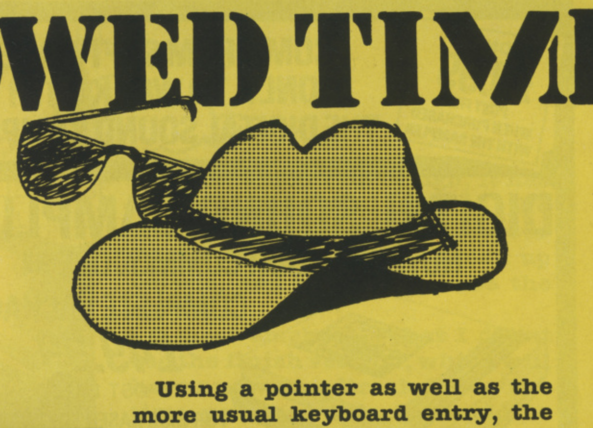
Overall, this is a really good game that should provide hours of fun for anyone who wants both arcade and strategy included in one excellent bundle.

Price: £8.95
Graphics ****
Sound ****
Playability ****
CCI Rating MEGA
Contact: Martech, Martech House, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE. Tel: 0323-768456.

CCI Rating: CRISP

BORROWED TIME



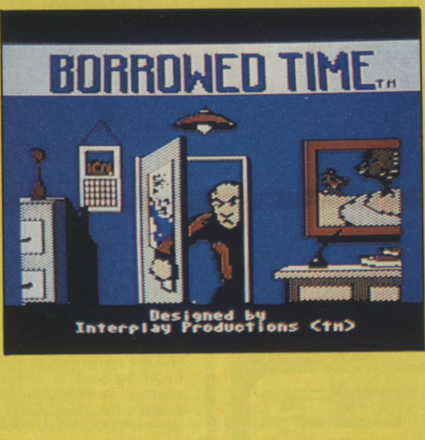


Borrowed Time

It seemed like just another day as I sat in my office waiting. Looking round I saw nothing had really changed. It wasn't until I saw the shadow in the window that I thought to myself.... here goes.

Activision's latest adventure release, previewed by us some three months ago, is set to be released very shortly. For people who have been fiddling with computers for a while you will find it reminiscent of the early Apple II detective adventures – if you haven't you're missing out.

You play a Philip Marlowe type character whose wife has been kidnapped. The aim of the game is to rescue her, kill a few baddies and basically illicit lots of information about who did what to whom and why (rather like being a Sun journalist? Ed).



Using a pointer as well as the more usual keyboard entry, the game has good gameplay (by that I mean it isn't impossible). Graphically too it is really good. I really enjoyed the game, and for all you people who want a clue: "O.K boppers, nowhere to run to, nowhere to hide!".

Price: £9.99
Graphics ****
Sound N/A
Playability ***
CCI Rating CRISP
Contact: Activision, 15 Harley House, Marylebone Road, London NW1. Tel: 01-935 1428

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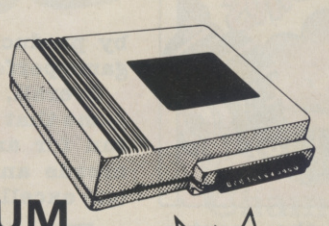

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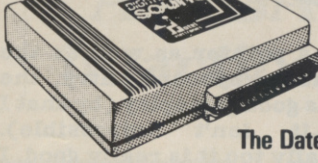

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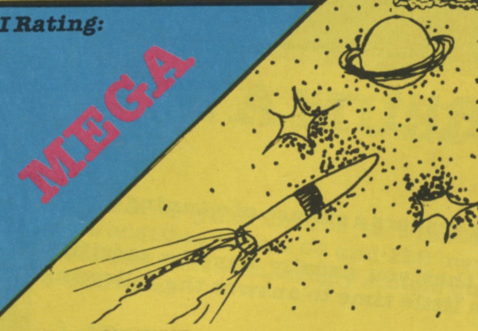
CCI Rating:

MEGA



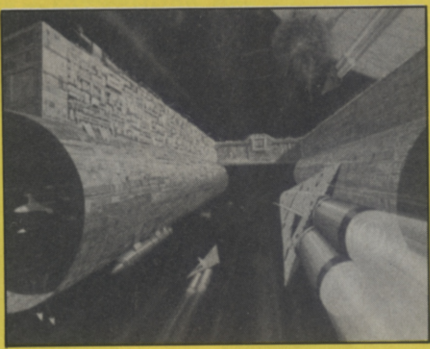
STARSHIP ANDROMEDA

STARSHIP ANDROMEDA

Ariolasoft are slowly but surely starting to make a noticable place for themselves in the software market. Although releases such as Wild West confused a lot of people, there is no question that it was a high quality product. This recent success can be attributed to two things; firstly the excellent design team at Ariola, and secondly the excellent programming house they have - the Hungarian Andromeda team.

Being a multi-section game, Starship Andromeda is best suited to disk, as each section has its own long and difficult (to say the least!) sections.

The games storyline is based on the fact that the galaxy is being run by the Federation under the tyrant named Alana (Blake 7 eat your heart out). To free the galaxy you need the Pentite necklace that Alana wears at all times, and to get that you need a powerful proton lance which will enable you to cut the necklace. When you get the crystal you can re-program the Mindlord computer!

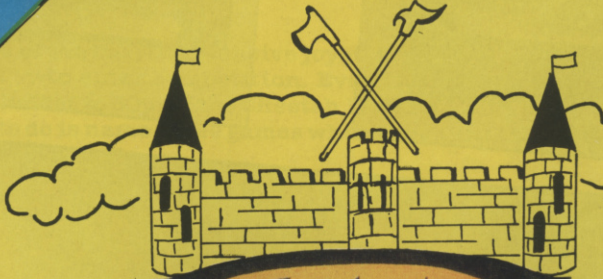


Graphically Starship is very good, especailly the jet-pac sectiion, and it will take a dedicated player many many hours to finish. Musically too, the game is good, if a little to reminiscent of previous Andromeda products.

Graphics ****
Sound ***
Playability ****
CCI Rating **MEGA**
Contact: **Ariolasoft UK , 68 Long Acre, Covent Garden, London WC2E 9JH Tel: 01-836 3411**

CCI Rating:

AWESOME

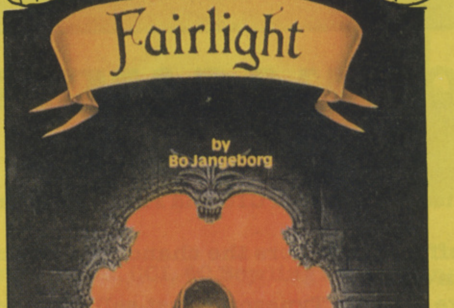


FAIRLIGHT — COMING SOON

The last time I went to visit Tim Langdell at The Edge I saw their first 64 game 'Wizardry'. At the time I predicted great success for this game, and duly it succeeded!

If Wizardry was good, then Fairlight on the 64 is superb! Undoubtedly, people will criticise its similarity to the Spectrum original, but personally I found the Spectrum version good, and the 64 version excellent. Considering the Speccy runs faster than the 64, Fairlight has converted outstandingly.

Graphically Fairlight takes a different route to Wizardry, as does the game itself. Fairlight will be easier for the beginner to get to grips with, but if anything more difficult to finish! Although Ultimatesque in its design, it has an amazingly real feel to the animation, epitomised when your character bends down to pick up objects, and when he climbs the stairs.



I must emphasise that I did'nt see the finish version, which will have a new soundtrack, but by the time you read this it should be available in the shops.

Tim Langdell, head of The Edge, seemed really pleased with the finished 64 version, and I can see why! The 3-D feel of the game is outstanding, as is its overall feel.

To sum up, Fairlight is the best arcade/adventure game for the 64 I've seen for quite a while, Magic!

CCI Rating: **AWESOME!**
Contact: **The Edge, 12/13 Henrietta Street, Covent Garden, London WC2 8LH Tel: 01-240 1422.**

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2. Which celebrated punk group recently had their first album put on Compact Disc?
A ____________________

3. Which company produced the world's first portable Compact Disc?
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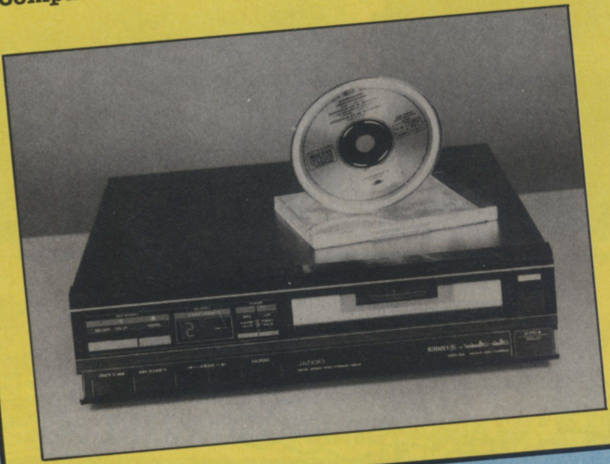
The sender of the first correct entry pulled out of our competition sack will be able to choose the Fisher Compact Disc player which best matches his/her existing hi-fi system!



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This is your chance to win Commodore's truly wonderful Music Expansion System, the perfect addition for all 64 and 128 owners who have any musical aspirations. To win, all you need to do is answer these amazingly simple questions – you'll find most of the answers in the review, elsewhere in this issue.

1. What does the term 'MIDI' mean?
A ____________________

2. What does 'FM' stand for?
A ____________________

3. What is a 'SID' in Commodore terms?
A ____________________

All answers should be sent to Music Competition, CCI, 40 Bowling Green Lane, London EC1R 0NE. The prize will be awarded to the first correct entry pulled out of our competition sack after the closing date of 7 May 1986.

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1.

2.

3.

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Age ....
Computer owned ....
Address ....
....

If you do not wish to cut up your copy of CCI, please feel free to send us a photocopy of the completed competition page.

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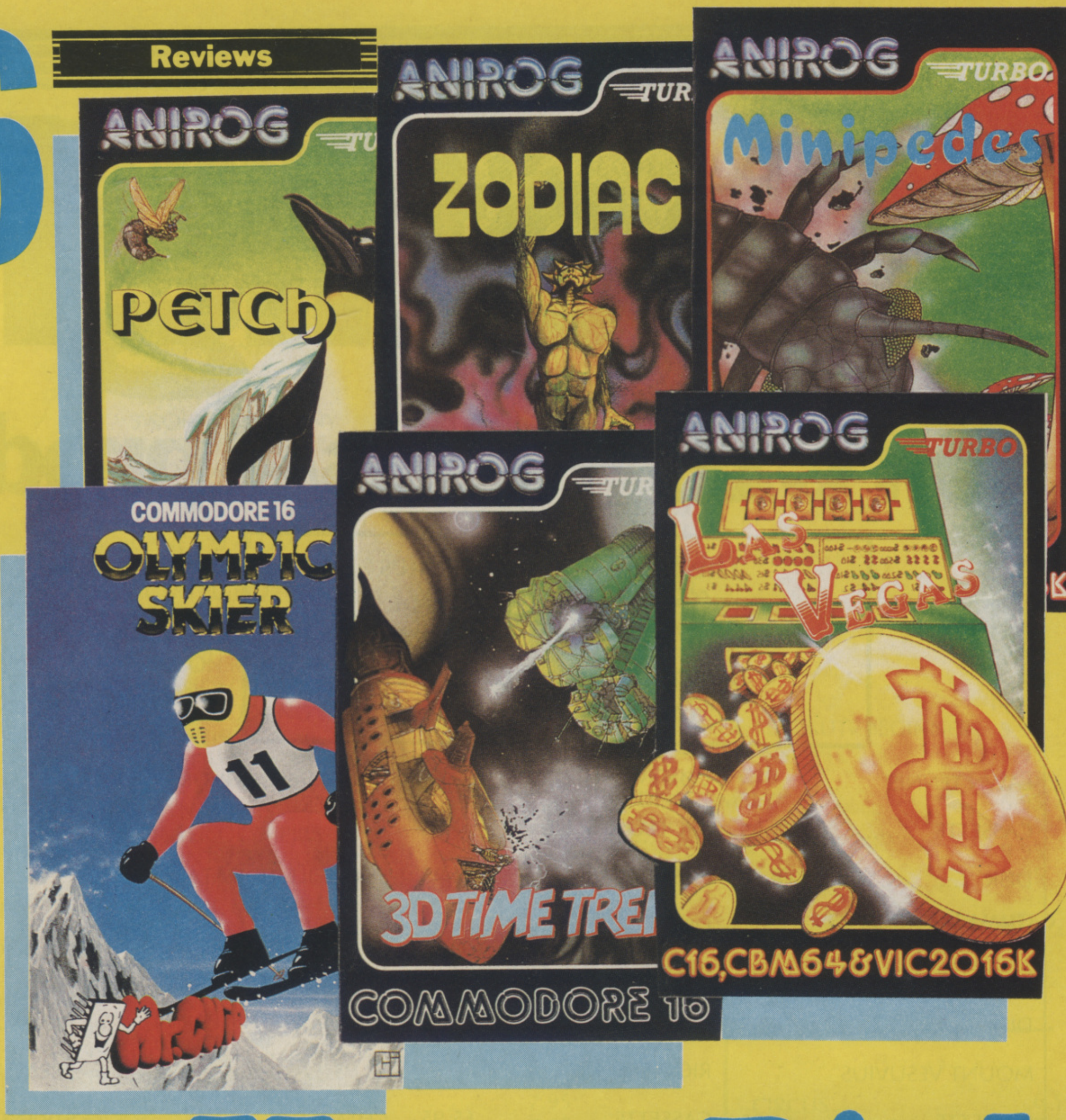

Take Your Pick

Don't be a berk! Invest in one or all three of the *CRL* games which make up the *Berks Trilogy: Berks, Major Blink and Berks III.* Some of the earliest C16 titles released, the Berks trilogy have stood the test of time offering many joystick snapping hours. All arcade-action has you blasting away at the Berks and stunning their faithful homing drones.

Defender-style games have retained their popularity over the years. *Probe Software's Defence 16* has you zapping down invading invader-type aliens which come at you from all angles. A little nifty finger work and plenty of thrust is required.

Perhaps surprisingly, there is still some demand for that good ole' favourite Pac-Man. *Mr Chip's Pacmania* is very true to the original. For those of you still unfamiliar with Pac-Man (Surely no-one? -Ed), you direct your Pac-Man around a maze, gobbling up power pills and fruit while avoiding the ghosts whose embrace is fatal.

Hopefully it will not still be snowing by the time you read this! If it is, why not put on the skis and try *Anirog's Olympic Skier.* In just 99 seconds, you must complete the three sections of this game: downhill, target jump and Slalom. Need I say – look out for the trees and rocks!

Still on any icy theme, *Anirog's Petch* has you lending a hand to Petch the plucky Penguin. Poor old Petch is trying to hide his diamonds in a maze of ice, but it is melting...and the dreaded Artic monsters, the Snowbow and the Snowbox, are hatching out. Oh no!!

The Artic is not the only place crawling with nasties. *Anirog's Minipede* is a mutant mushroom monster devouring everything in sight. He is aided by the mushroom laying flea (shome mishtake shurely?). Your task, of course, is to destroy the minipede – and anything else that moves.

Hubble, bubble, toil and trouble – a coven of Black Magic Masters has gained terrifying power in *Anirog's Zodiac.* Destroy their demons, collect the 12 mystical signs and return them to the time vaults. Shoot, and then run like hell – for that is where you are!

After demolishing a few demons and masters of Black Magic, marauding space pirates should prove no problem. *Anirog's 3D Time Trek* has you in charge of a newly designed super powerful starship, bristling with computers and sensors. These will come in pretty handy in your search to seek out and destroy the space pirates.

Now sit back, relax, and try to make a fast buck. *Las Vegas, from Anirog,* is a simulation of the modern fruit machine. The odds are against you, but you'll have fun deciding whether to gamble, hold, spin the reels or collect!

Man-eating nasties are out to get you in *Bug-Byte's Solo.* The Solo fighter has the lastest fire power and maximum manoeurability to attack the vicious aliens. Beware the trackers and mutants and watch out for the mines – which ones are dummies?

Spotlight on C16 + Plus/4 products

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cont'd on page 75

From this month forward, the Mud column will start to change. I intend to start concentrating more on the problems people are faced with in Mud, and offer some cryptic advice. It is up to you, however, to de-code the clues! If you have a question about Mud, write to me at: 31, Marine Court, Southsea, Hants PO4 9QU, and I will try to put an answer in the following month's issue. Please note that I will not answer letters personally, much as I would like to, because I simply do not have the time to deal with each case individually. As long as the question has not been asked before though, I will reply in the following issue.

This month's column includes a map of Mud. I know that some of you already have these, but I have had many requests for one, so here it is. Next month, there will be a map of the Land adjoining Mud, Valley, which has 96 rooms. These maps show only the above ground locations, and none of the underground ones such as the Dwarf Realm. Neither are any of the treasurers shown. Use this map to explore areas you haven't been to before, to expand your knowledge of the game. A word of advice however. When you go underground in the mines, map it out, otherwise you are bound to get lost!

Link software

As Compunet Mud Players will know, a new 'link' software has been made available to players. The new software enables players to print and save copies of the display from when you entered the game until the time you choose the option, scroll back up through previous screen displays, enabling you to refer back to a previous conversation. This is especially useful if you are a wizard conducting several conversations at once, and provides separate input/output windows so that everything you enter is typed on the bottom lines of the screen, and everything sent to your terminal appears at the top of the screen! This software has received mixed response, mainly because Compunet are charging £7.95 for the privilege of using it! There have also been several complaints about a graphic displayed permanently at the top of the screen that takes up about six lines! As a wizard, I find this new software incredibly useful, and newcomers to the game also find it easier to play the game with, but a lot of the more seasoned mortals use the old 'teletype' software rather than pay £7.95.

As I mentioned in the February issue, you can contact me on 0705-833830 if you need a question answered. Kate and David, the other two Arch-Wizards, have asked me to publish their numbers as well. Kate's is: 051-220 0522 and David's is: 04862 28920. On Compunet you can also contact us via our mailboxes. Mine is ZAPHOD, Kate's is ML16 and and David's is DWC1. Please do not phone after 11pm, or you will get a highly annoyed Arch-Wiz on the other end of the 'phone'!

Spectaculars

Since Christmas we have had several spectaculars. Unfortunately, during two of them the Compunet system host computers, run by ADP, decided to develop hardware faults, so the spectaculars were constantly plagued with crashes. In fact the second one had to be aborted about five times (I was getting so angry I lost count!). We did at last manage to get them finished, and a fairly consistant winner of these spectaculars seems to be Zircon, who has gained about 35,000 points by playing them. I think this proves my point that a lot can be gained from playing these games! Spectaculars will be held fairly regularly, probably once a month from now on. Watch the MUD UPDATE spot on page 107923 on Compunet for specific times and dates.

I mentioned in a previous issue that MUSE are working on a non-MUD type Multi-User Game (MUG). It has now been hinted that the prose, meaning the location descriptions and so forth, is being written and designed by Level9, the well known adventure game writers famous for such games as Colossal Adventure, and Snowball. If this rumour has any substance, then the result should be very, very good.

MUD2 is nearing completion, and is all set to go up in an almost finished format in the next few weeks. The game will have over a hundred lines going into it, and when one game fills up, another will start, until all the ingoing lines are full. So, MUD2 subscribers, one of these days in the not-too distant future, you will log-on expecting to find yourself in Valley, but instead find yourself in the land of MUD2, and what a nice surprise that will be! As soon as the game has been properly implemented, I will bring you a full run down on it.

Cryptic hints

Now, here are those promised hints. I will start in this issue with some of the most common questions, but in following issues the clues will be for some of the more obscure puzzles in Mud.

One of the most common questions in Mud, asked by new players, is *'where can I find the swamp?'* Before all you seasoned players start guffawing, don't YOU remember asking the same question at one stage? The answer is very simple. From Narrow Road Between Lands, keep on going south until you get to the river. Follow the river until you get to the Rapids. Then go South. Alternatively, just keep typing 'swamp' and the game will automatically move you one move in the direction of the swamp. Just keep typing 'swamp' to get there!

'How do I get over the cliff to the beach below?' All I can say to that is, think of Mary Poppins!

'The Tomb in the Graveyard asks me for a prize to open it.' Do you think they might have forgotten to check the spelling when they wrote the game?

'Why on earth is there a toad in the Pool in Swamp?' Remember the fairytale?

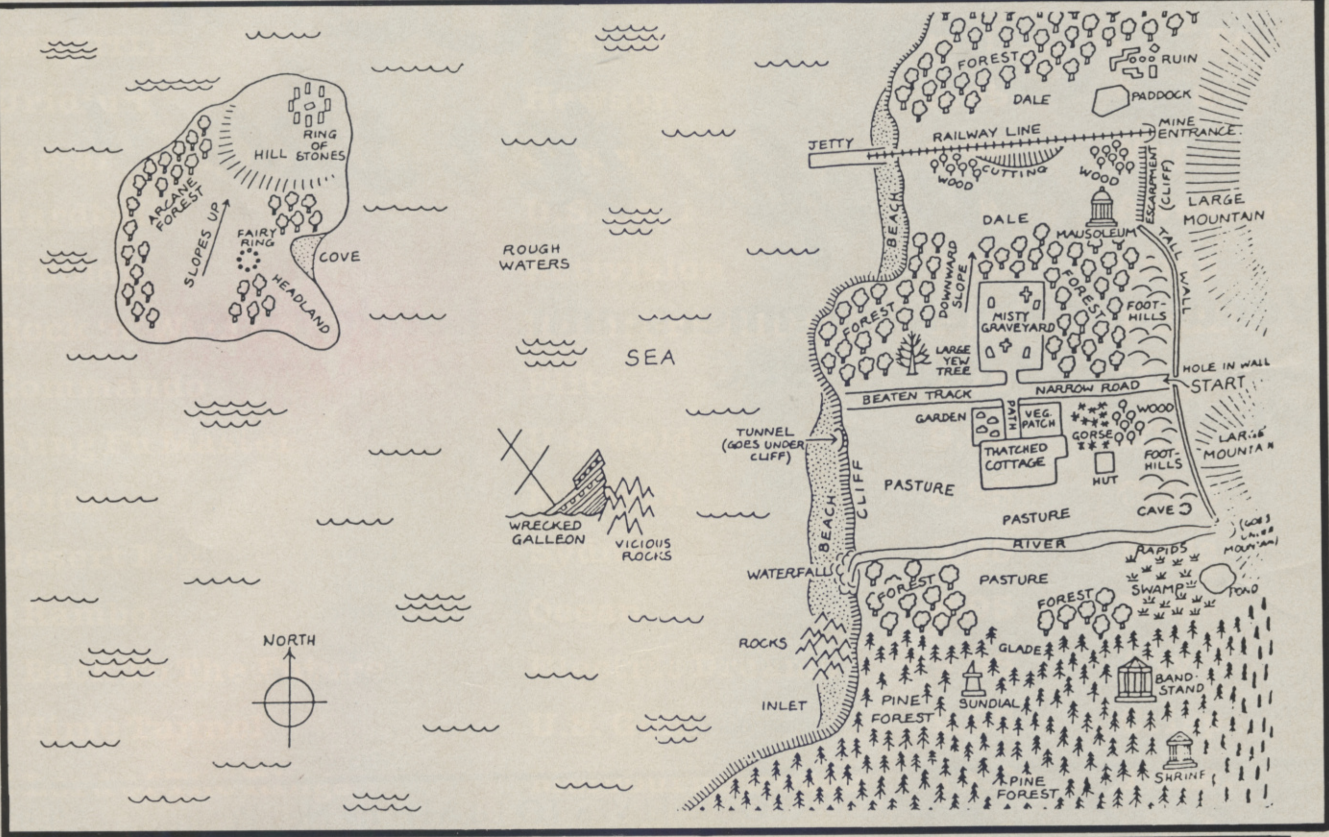
'Where can I light my brand?' Try a fireplace-there's only one of them!

There, that's all of them for this month. More in the next issue, and don't forget to write in if you have a question!

Not many players seem to be venturing beyond the mainland. Try venturing forth into the unknown, and don't be discouraged if your small craft overturns-try again! Try Dragon Island, for there is a lot of treasure to be found on it, and in it...... The Galleon also contains some treasure, and also holds the key to raising your stamina if its low after a fight. You can even leave your mark there, by writing in the captain's log with the quill that has very thoughtfully been provided!

Zeon the Wizard has asked me to mention his section in Compunet, called Mudders Anonymous. It is an area where those who cannot give up the addiction of playing the game can go and meet other addicts. The area contains many hints and helps, but also much non-Mud orientated material, such as adventure helps. Mailbox him on his ID, ZEON for membership.

Don't forget to read next month's issue for more hints and gossip, and for the map of Valley. ----*Zaphod the ArchWizard has just disappeared in a puff of smoke.



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BOOK REVIEW

AMUSING OURSELVES TO DEATH by Neil Postman – £9.95

What can you do with a television set apart from watching it or using it as a computer monitor?

How about a light to read this magazine – just switch it on, turn the sound down and sit with your back to the set. Or how about a bookcase – the bigger the screen the more books you can pile on top. You might do either of these two but the chances are you'll just sit and watch. Television and literature don't go hand in hand, television is not an extension of the written word and instead of keeping our literate culture going it's doing its best to annihilate it.

To sit down and read a book requires a number of demands to be met. You have to sit still for quite a long time and that's just for starters. You also have to forget about the shapes of the letters on the page and assimilate what the writer is trying to put across. Not only that but you must have the ability to distinguish between a joke and an argument, learn to negotiate the world of abstractions and rid yourself of the notions that words are magical. To be able to do all these things, and more, is, as Mr Postman tells us, a primary definition of intelligence in a culture whose notions of truth are organized around the printed word. But though this may have been true in the eighteenth and nineteenth centuries, a time in which America (where the main subject matter is based) fell into this category, the twentieth century has a society whose ideas about truth and intelligence have changed as a result of the new media displacing the old. By reading this review, and even more so, by actually going out and buying the book (or any book for that matter) you are part of a dying culture. Amusing Ourselves To Death takes a new look at how television is affecting the way we live and the way we think.

How does the new electronic culture then so drastically effect us? Mr Postman says we have come to regard televison as natural part of our lives, and that this 'meta-medium' directs not only our knowledge of the world, but our knowledge of ways of knowing, our wants and our behaviour. That's all well and good but what does that actually mean to me? you may ask. Well the answer is that your life and your knowledge are being trivialised more than ever before. Take for example a "serious subject", the news – when you switch on the television tonight take a close look. The news begins with a specially composed piece of music, which also ends the show; we are shown fast film footage, the reporters don't cry when thousands are dying in Ethiopia "where we bring you this special report", the important part of the show is the new sexy newscaster, the amiability of the interviewee; the ideology of all television is that no matter what is being shown or said it must be entertaining. The "news" is not for information, reflection or catharsis, instead it must be entertaining and "good television" (which has very little to do with "good"). That is the basic problem that we are presented. Our minds are amassing knowledge more suitable for a game of "Trivial Pursuit" than anything else. And not only are our minds being altered, but our position of being in control of our own destiny becomes weakened. Although we 'know' more about what is going on all over the world, we have less power to affect major issues like the purchase of nuclear arms. In terms of politics the US has a President who started his career as an actor whose TV image, took him to the White House. Margaret Thatcher's "image-man" was included in the New Year's Honours List ... a reward for changing her hairstyle and TV voice.

We are probably living in a race between understanding – and action – and disaster. We are all very "media conscious" but if we are to avoid the warning of Aldous Huxley's Brave New World, that we will see and hear the truth but fail to care, we must see the necessity to understand the politics of the mass communications – and the author points out that computerization challenges the printed medium in virtually the same way. Mr Postman in his book helps us along that path to understanding.

Max Jacobson

Contact: William Heinemann
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TOP TWENTY

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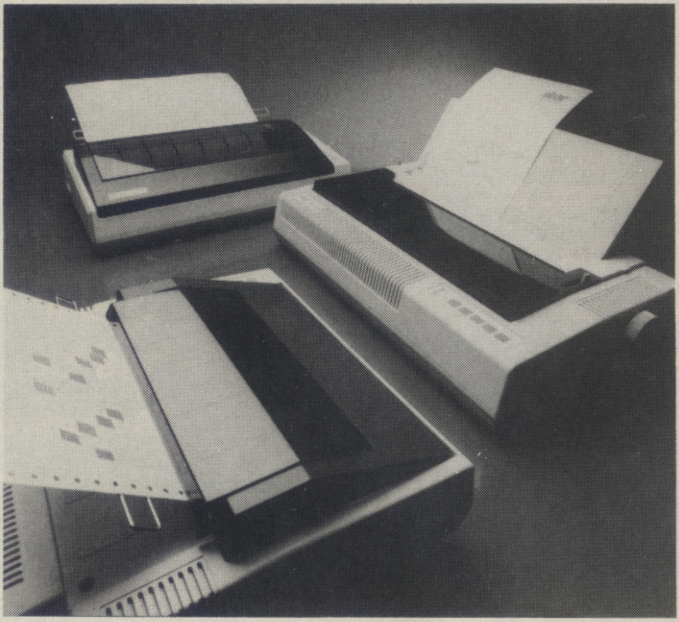

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Books
REVIEW

THE C PROGRAMMING LANGUAGE, by B.W.Kernighan & D.M.Ritchie – £22.95

This book is usually accepted to be the industry standard reference book on the C language since the authors are also the originators of this language. Once again the contents are not directly related to the AMIGA in the sense of providing programs that will run the sound or graphics facilities but provides more of a learning platform before the publication of such books. C is THE language of the AMIGA, by this "I mean that the bulk of the operating system components such as INTUITION, AMIGADOS and WORKBENCH were written almost entirely in C. So C is very important to the AMIGA and how it performs thus a working knowledge of C is a pre-requisite for serious work.

Unlike the earlier Commodore machines which relied on assembly language as the software of the operating systems, the AMIGA because of its complexity could not take such a route, the cost in addditonal programming hours necessary would have been astronomic although the outcome would have been only marginally better in terms of operating speed. So C has the benefits of appearing to be a high-level language to the user and a low-level language to the machine. Surely this describes the ultimate programming I hear you cry? Well, the answer there has to be personal opinion, certainly C does not seem require you to know the hardware characteristics to the depth that FORTH does (they'll probably throw me out of the FORTH Interest Group UK for that one!) before you can produce anything of value. But on the other hand,to get to grips with learning to program C really requires you have some exposure to a structured programming language, which certainly not one of the various versions of Commodore BASIC can lay any great claim to be. PASCAL or COMAL would be the best entry points, with COMAL being the best route for those who have never moved beyond BASIC. Once more, personal taste accounts for the chosen path, but it would be a brave programmer who tucked into helpings of the lassaigne of C after pushing aside the spaghetti of BASIC!

To give those readers who have not seen what a C program looks like I have included one below along with its equivalent in BASIC, PASCAL and COMAL. The program function is self-explanatory.

```
main (1)
/*start of program*/
printf ("welcome to,");
printf ("Commodore Computing magazine");
printf ("n");

5 REM start of program
10 PRINT "welcome to,"
20 PRINT "Commodore Computing magazine"

(start of program)
begin
writeln ('welcome to, ');
writeln ('Commodore Computing magazine');
end.

5 //start of program
10 PRINT "welcome to,"
20 PRINT "Commodore Computing magazine"
```

Not the best selection of programs, but at least it demonstrates just how different the languages are and in particular, the closeness of C to PASCAL.

C was designed for UNIX which is an operating system for use on mini-computers and mainframes. UNIX has been around for over 10 years now so in computer chronological terms it equates to medieval. However, UNIX is far from medieval in use (IBM might disagree with that!) and has started to drift down to the personal computer level, although you need a hard disk and a mpu of the ilk of the Z8000 to support it. The strength of UNIX lies in its ability to cope with multi-tasking and at this point the language called C entered the arena. You should by now start to see the connection with the AMIGA. C is designed to be totally unrestricted by the hardware or operating system and although this is the usual hype applied to most computer programming languages C is by far the best of a rather motley crop when it comes to shifting or porting a program between machines.

The book is described as a tutorial to C and assumes that you are familiar with general programming concepts. To this end if failed since the size and layout did little to help this concept. Similarly, I found it necessary to do some tweaking of the programs in the book to get them to run on my own AMIGA. I could be a little unfair here since it could well be the fault of the C compiler supplied with the machine, it is known to be not the most robust of C compilers.

I really feel that it is not possible to teach the fundamentals of C even in the space of 228 pages and although this book contains all of the essential references about the language it should not really be the first one on your shopping list. Having said that I would still recommend that you make a point of acquiring this book, the amount of information it contains about C makes it worthwhile. I am still looking for a good introductory text on C programming which will undoubtedly be reviewed here, but for the moment none seem available.

Contact: Prentice-Hall, 66 Wood Lane End, Herfordshire HP2 4RG. Tel:0442 58531.

THE BIG RED BOOK OF C, by K.Sullivan – £7.50

The main function of the book is to introduce the commonly used aspects of C and this it does very well although not without some drawbacks. The first being the dimensions of the book, slightly greater than a paperback which leads to text compression on a subject that can be heavy going at times. Secondly, there is just not enough and I only wished that Kevin Sullivan, the author had provided more. The constraints of price reflect here not in writing style or subject coverage I hasten to add, but in the overall concept of the book, 165 pages is simply not enough to do justice to C. There are a lot of 'meaty' programs in this book and more importantly they work, or at least they did on my AMIGA, with less modification to them than those shown in 'The C Programming Language'.

We are led well into the features of C and the topics covered in the space available are remarkable, files, command lines and structures are a few. I particularly liked the chapter on printer drivers and existing users of software developers AMIGA's will know what my drift is there. The last chapter covers sorting and unfortunately only covers the Shell Sort. I found this book easier to assimilate and although my detractors would accuse me of an anti-american bias in terms of computer book authors, I would still stand by my feeling that books from across the water are in two categories, very good or appalling.

I wouldn't recommend that you buy ANY book on the basis of price alone, although this book is undeniably very cheap. The range explored by it is both readable, relevant and accurate and my only complaint can be that it is too short, I would have gladly paid more money for more pages. Once again I wouldn't mark it down as your first book on C, but the contents show you what you can and can't do with this language. If you do see it on the shelf in the bookshop, buy it anyway, you'll not regret it.

Contact: Sigma Press, 5 Altan Road, Wilmslow, Cheshire.

BASIC for begginners

PART IV

Loops and control are the next lesson given by Bill Donald in our learn to program in Basic series.

Loops and control; what do these mean in BASIC programming? If you recall in the February 1986 issue of CCI I looked at how the computer actually executes a program. It runs through each command in sequence, not necessarily in numerical line order if there are any GOSUB or GOTO commands present, until the end of the program is reached. This process of program execution is very fast and it may be that we want to count something that is part of the program such as a variable or how long an event within the program took. In fact when you really think about it all a computer does is spend its life counting, even when it is not running a program.

FOR NEXT loops act as these counters and can be set to run at any speed you desire. A simple loop such as:

```
10 FOR A = 1 TO 20
20 PRINT A
30 NEXT A
```

will print the numbers 1 to 20 down the screen quite quickly, but perhaps you want this run at a slower speed. There are a number of methods of doing this, the usual ones being to use smaller cuts from the start and finish value. In other words rather than using integer numbers (whole numbers), use decimal numbers. Alternatively, we could use another counter to count the time it takes the first counter to step from each value.

In the above example we were counting from 1 to 20 and we were using a value of 1 between each count using the FOR NEXT loop. If we introduced another FOR NEXT loop that made the first one pause between each step because the machine has to now count this additional FOR NEXT loop this action would provide a brake on the whole process.

```
10 FOR A = 1 TO 20
15 FOR B = 1 TO 20 STEP 0.5
20 PRINT A
25 NEXT B
30 NEXT A
```

If you run this program you will see a series of chunks of value A starting as 1, then after 40 of these have been printed the value move up to 2 and a further batch of 2's is printed. The value of 40 came from 20 divided by 0.5 since this counter, our FOR NEXT loop B is being stepped through this increment or cut. The program needs tidying up on the screen so if we add a further line to clean up the screen our program now looks like this:

```
10 FOR A = 1 TO 20
15 FOR B = 1 TO 20 STEP 0.5
16 PRINT CHR$ (147)
20 PRINT A
25 PRINT B
30 PRINT A
```

This will clear the screen each time although the flicker effect is the machine running through the loops counting and wiping the screen, in fact it is not really getting sufficient time to do this, hence the flicker. Try the following program which actually shows loop B working:

```
10 FOR A = 1 TO 20
15 FOR B = 1 TO 20 STEP 2.0
20 PRINT A
25 NEXT B
26 PRINT CHR$ (147)
30 NEXT A
```

Where we have more than one loop in a program it is termed 'nesting' and there are no restrictions on the number of nested loops allowed in Commodore BASIC. There is a catch, you have to remember LIFO which means 'Last In First Out', in other words ensure that each loop finsihes with a NEXT and for the last FOR instruction is the VERY FIRST NEXT instruction otherwise you will get a screen message saying NEXT WITHOUT FOR error. You will notice the new command STEP which can also be assigned to a negative value although make sure that your initial set of the FOR section has the high value first like this:

```
15 FOR B = 20 TO 1 STEP -2.0
```

Otherwise another NEXT WITHOUT FOR error will be thrown at you!

FOR NEXT loops are not restricted to counting in the sense described above, for instance you could use string variables as opposed to numeric varialbles in the loop. The drawback to this is the additional program lines of defining the strings.

DO LOOP is even simpler to understand although owners of machines that have Commodore BASIC 2.0 and 4.0 will not have this command avialable to them. This includes the VIC-20 and C64, owners of the C16, PLUS/4 and C128 do have this command and it is very easy to learn:

It works by executing all the statements between the word DO and the word LOOP. Consider the following program:

```
10 X = 15 : SCNCLR
20 DO UNTIL X = 1
30 X = X – 1
40 COLOR 4,X : COLOR 0,X
50 LOOP
60 GOTO 10
```

Line 10 assigns a value of 15 to variable X and then clears the screen, line 20 instructs that every operation between the words DO LOOP are to be executed until the value of X has reached 1. Note the similarities between this and for the FOR NEXT STEP structure, only just how much clearer this is. Line 30 states that X is now 1 less than the previous value of X, thus on the first pass of the loop X was equivalent to 15, the second pass it will be 14, the third pass 13 and so on. Line 40 then tags the value of X on to a simple screen and border colouring, and then the end of the loop is reached in line 50. At this point the machine pauses to examine the value that X is holding and having been instructed to continue passing through the loop until X is equivalent to 1 it does just that until this event occurs. However, the speed of the loop is quite fast so line 60 sends the program back to the start for another turn. This is another form of a loop although this outer loop has no counter and therefore no control and will continue forever until the RUN STOP key is pressed.

The counter in the main loop was the word UNTIL. This let the loop continue until a condition was satisfied, in this case the condition occured when X was equal to 1. If you think about this process further, what was really being said was that until the condition of X being equal to 1 was TRUE then continue the loop. Where we would want a process to continue when a condition was not true or FALSE the we would use the word WHILE.

Look at the program again only this time change the word UNTIL to WHILE:

```
10 X = 15 : SCNCLR
20 DO WHILE X = 1
30 X = X - 1
40 COLOR 4,X : COLOR 0,X
50 LOOP
60 GOTO 10
```

When you run this program the screen will clear but there is no colour cycling taking place, why? The answer lies in lines 10 and 20, line 10 states that X is equal to 15 whilst line 20 states that while X is equal to 1 then pass through the loop. In this example the condition of X is detected to be FALSE, so the program control is passed to the line after the word LOOP which is line 60, which simply returns the program back to the start.

The structure of this DO LOOP conditional looks like this:

```
something: UNTIL the condition is TRUE
DO
something: WHILE the condition is FALSE
```

All versions of Commodore BASIC support the IF THEN expression which is another way of determining conditionals and passing program control to another part of the program. The following program gives a very clear insight into this:

```
10 A =2 : B = 4
20 IF A = B THEN PRINT "TRUE"
30 PRINT "FALSE"
```

By running this program the machine will print out the answer as being FALSE. Quite correct, the condition was tested and found to be false so program execution moved on to the next line. If we changed the program to this:

```
10 A = 2 : B = 2
20 IF A = B THEN PRINT "TRUE" : GOTO 50
30 PRINT "FALSE"
40 END
50 PRINT " AND I AM NOW DOWN HERE"
60 LIST
```

You will see that the program must have branched at line 20, otherwise it would never have reached beyond line 40 because of the END command. The condition on line 20 was TRUE.

There is an extension of the IF THEN and DO LOOP conditional for user of BASIC 3.5 and BASIC 7.0, this is the ELSE statement. Let's look again at these conditional structures:

```
something: UNTIL the condition is TRUE
DO
something: WHILE the condition is FALSE
something is TRUE: THEN follow branch instruction
IF
something is FALSE: THEN move straight to next program line
```

As you can see the IF THEN structure does not allow a branch when a condition is FALSE, the ELSE statement allows this:

```
something is TRUE: THEN follow branch instruction
IF
something is FALSE: THEN move straight to next program line : ELSE follow branch instruction
```

Take another look at this program which now includes an ELSE clause:

```
10 A = 2 : B = 4
20 IF A = B THEN PRINT "TRUE" : ELSE GOTO 50
30 PRINT "FALSE"
40 END
50 PRINT"AND I AM NOW DOWN HERE"
60 LIST
```

After you have run it you will see that it did not print the word FALSE as before, because the program did not reach line 30, it branched at line 20 because the condition was detected as being false. Try changing the program to this and see what happens:

```
10 A = 2 : B = 2
20 IF A = B THEN PRINT "TRUE" : ELSE GOTO 50
30 PRINT "FALSE"
40 END
50 PRINT "AND I AM NOW DOWN HERE"
60 LIST
```

Counting and testing for conditions are two fundamentals of understanding computer programming in any syntax, be it BASIC, PASCAL, C or assembley language.

You will have noticed that I sneaked in the GOTO command in the programs. This command is another self-explanatory word, although be very, very careful with it. The reason for this warning is because it is very easy to start sprinkling GOTO's in your program and really tying both yourself and the program into knots because the program flow or control is jumping about all over the place. It is an unfortunate truism of programming that the program you wrote yesterday is unintelligible today because the programmer lost sight of what the program was trying to achieve. Remember, keep it clear and simple even it does mean more lines of program code. The best way to maintain clarity is to stop and keep going back to the start and reading the program through. If YOU can't follow it then there is something radically wrong. After all, you are the author of this masterpiece or disaster. If you do have lots of GOTO's in your program then endeavour to keep the jumps numercially short so that your eye is not too far removed from the point of origin of the jump and you can see why the program branched to this part.

I always prefer to use GOTO for the shortest possible branches, that is no lines at all, how do I do this? Easy, consider this program:

```
10 GET A$ : IF A$ = "" THEN GOTO 10
20 PRINT "YOU PRESSED A KEY DIDN'T YOU?"
```

The first line informs the machine to assign the variable A$ to any key on the keyboard (with the exception of RUN STOP), and then to test for the key being pressed. This is checked for by the IF THEN conditional. Remember from earlier, if the condition was true then follow the next instruction on the same program line. In this case the condition is true becaue A$ has been assigned the null value "" and the machine has not detected a key being pressed, so the program will cycle around line 10. When a key is pressed, the value of A$ becomes something else so the condition at the start of line 10 is no longer true and the program continues on to line 20.

GOSUB is the other GO… command and again watch out for excessive jumping around. There are two parts to using GOSUB which is shorthand for 'go to the subroutine (subsidiary program) located at line number ….', the other part is RETURN. This is after all, a SUBprogram and not the main program so a subroutine must always end in RETURN in order to get back into the main program. This is a very common error and the outcome is a screen message saying UNDEF'D STATEMENT ERROR IN….

Whenever a subroutine has been added to program it is safest to place it at the rear of the main progarm. This is because of the mehtod of program execution by the machine. Suppose we had a program running like this:

```
10 ..main program
20 .....
30 .....
40 .....
50 ..GOSUB 500
60 .....
70 .....
80 ..finish of main program
500 ..subroutine start
510 .....
520 .....
530 ..RETURN
```

As this program stands the machine would quite merrily charge through the program until it hit line 500, at which point an error would be thrown up. But we know that line 500 is the start of a subroutine and not the main program, how do we tell the machine this? The answer is you can't TELL the machine, so you have to build a blockade at the last line of the main program which in this case is line 80. Our amended program looks like this:

```
10 ..main program
20 .....
30 .....
40 .....
50 ..GOSUB 500
60 .....
70 .....
80 ..END
500 ..subroutine start
510 .....
520 .....
530 ..RETURN
```

The command END stops the main program dropping through on to the subroutine. Next month I'll be looking at screen management, until then keep programming.

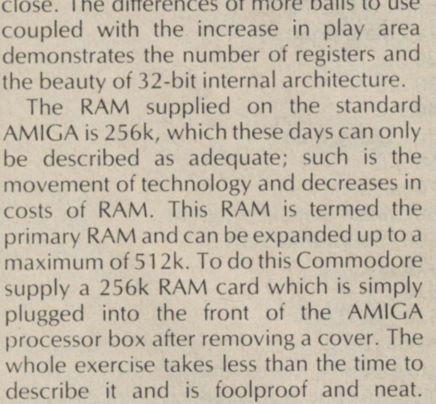
Amiga Hardware

Bill Donald provides a basic overview of the hardware and the features associated with the hardware of the Amiga

The AMIGA uses the 68000 processor running at a clock speed of 7.2 MHz. Although this clock speed is lower than the 68000 can run at, the custom circuits have dictated this. The clock speed is still respectable by any standards, considering that the IBM-PC runs nearly 50% slower and the 6510 of the 64 runs at a shade under 1 MHz. The 68000 provides a 24-bit address bus giving a maximum addressable memory of 16 MBytes.

There are also two other registers, the program counter, which is also 32-bits wide and the status register which is 16-bits wide. Although this looks very daunting for programmers who were bred on 8-bit processors, for those of us who arrived via the 6502 BBC, Commodore, Apple or 6809 Dragon, Tandy routes, as opposed to the Z80 Sinclair, Amstrad path, the 68000 is not as difficult as it looks. I feel the analogy between playing billiards on a small table at home and then trying snooker on a full size table is reasonably close. The differences of more balls to use coupled with the increase in play area demonstrates the number of registers and the beauty of 32-bit internal architecture.

The RAM supplied on the standard AMIGA is 256k, which these days can only be described as adequate; such is the movement of technology and decreases in costs of RAM. This RAM is termed the primary RAM and can be expanded up to a maximum of 512k. To do this Commodore supply a 256k RAM card which is simply plugged into the front of the AMIGA processor box after removing a cover. The whole exercise takes less than the time to describe it and is foolproof and neat. Secondary RAM will be made available through third-party suppliers and attaches to the side of the processor box where the full 68000 bus is available on edge connectors. At the time of writing (Dec 1985) Commodore are stating that 8 MBytes is the maximum secondary RAM, although this will probably be revised and go up to 14-15 MBytes (1 MByte has to be retained for the operating system).



Although I stated earlier that the standard machine is provided with 256k RAM it has in fact 512k RAM. However, on loading the operating system in from disk this is write-protected and inaccessible by the user. My own opinion on disk based operating systems is one of support for this technique. It is quite the norm for PC-DOS and MS-DOS and allows the manufacturer much greater flexibility with upgrades. I feel that the need for an operating system in ROM is unnecessary provided disk loading times are fast, which is certainly the case with AMIGA. It is also a lot easier, cheaper and quicker for users to change disks than ROM's.

Custom Circuits

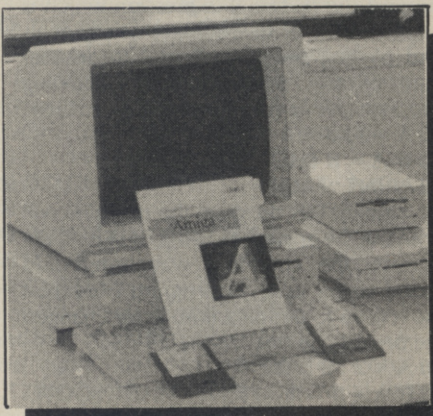
The custom circuits which use girls names for their designation are PAULA for sound and peripheral control, AGNUS for animation and DENISE for graphics. This is probably an opportune moment to scotch any legends that may grow around the identity of these names and they are derived as follows. AGnus is the Address Generator circuit, DeNisE is the Display Encoder and PAUla is the Ports, Audio and Uart. Some idea of the complexity of these circuits may be gained by realising that they contain about 20,000 transistor junctions EACH.

PAULA allows four voices of sound to be configured into two stereo channels. This may not appear too impressive until you realise that the AMIGA will multi-task, this will allow in theory a maximum of 32 voices or 16 on each channel – multiplexing each channel into quadrophonic sound is also possible. The sound itself covers 9 octaves so frequency response is not a limitation, similarly the waveform structure is free and you are not tied to pre-determined such as square, sine or triangular.

Modulation of the sound can be either frequency or amplitude parameters and once again the use of multi-tasking will enlarge the possibilities here. This degree of user control over the sound parameters makes apparent the in-built quality of the output. DC switching plops and clicks are absent and the marked absence of any noise in the sound signal provides the AMIGA with true 'hi-fi' output.

The disk controller, general purpose I/O port registers and digital to analogue registers are also located within PAULA. Access to these ports is on the back of the processor box and, at long last, Commodore have abandoned their proprietary interfaces. The AMIGA has industry standard ports for RS-232C, Centronics Parallel, RGB Analogue, RGB Intensity. These ports also use standard 25 pin D-connectors. Composite video and TV outputs are also available using standard phono plugs.

DENISE, the graphics circuit, can provide any number of user-defined display resolutions. The range of resolutions runs from 320 x 200 up to 600 x 400 and can be displayed simultaneously in any mixture of modes. In other words multiple windows which each can contain text in varying degree of size from 40 to 80 columns are displayed along with other windows also containing low or high resolution graphic images. The degree of resolution has an effect on the number of displayed colours but I would not have thought that 16 or 32 would have been too much to cry about.



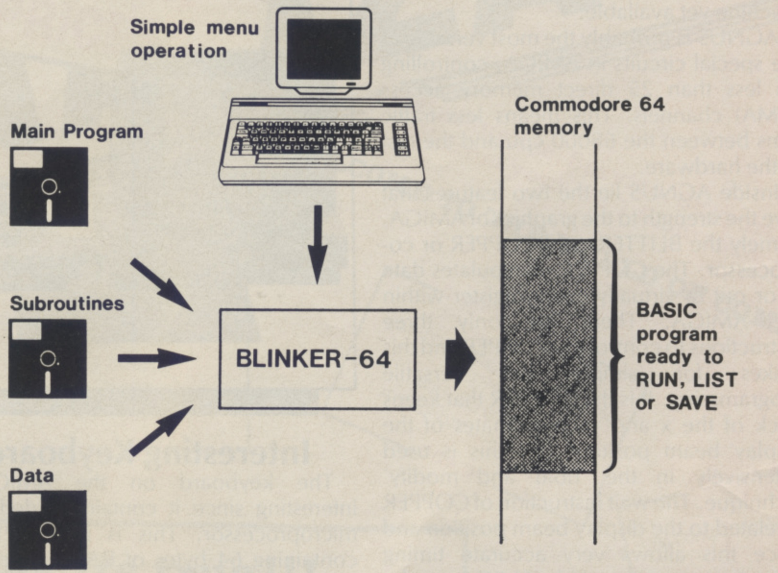
Hold and Modify

To obtain more colours into a graphics display it is necessary to invoke the 'hold and modify' or pixel colour interlace technique into the raster. It is also this principle that enables the AMIGA colour monitor which is rated at 600 x 200 to display 600 x 400 pixels. 'Hold and modify' can best be described as chopping the horizontal raster into sections and then very rapidly alternating the pixel colour value. The technique relies on the slowness of the eye to catch up with the raster and the afterglow effect of the screen phosphors. The colour register sizes in DENISE make it possible to define and use a maximum of 4096 different colours and display all of these if required using 'hold and modify'.

Get your basic programs under control

BLINKER — 64

(Basic Linker for Commodore 64 and 1541 Disk Drives)



Do justice to your programming skills

Whatever your level of programming skill, it is difficult to produce any but the simplest programs in BASIC. The amount of text in a program means that you have to spend more thought and time on organising your program than you do on what the program is supposed to do. This is commonly known as "The Problem of Scale" which, in simple terms, means that there is a (fairly small) limit to what a human head can think about at any one time.

Professional programmers have for many years attacked this problem by breaking down their programs into small source modules which are compiled or assembled separately and the resulting object modules are combined into a complete program by a linkage editor (or linker).

Now you can develop programs in this way using **BLINKER-64,** INDEV's BASIC Linker for the Commodore 64. BLINKER-64 combines source modules directly into a final source program ready for the BASIC interpreter.

Features of BLINKER-64

- Easy to use menu operation.
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- Subroutines (saved on disk) included by **GOSUB "filename".**
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- Source modules may reside on any number of floppy disks.
- Modules containing data statements (e.g. sprite definitions and machine code programs) automatically appended to programs.
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- BLINKER-64 takes no space at all away from BASIC programs. It resides in areas of memory not used by BASIC.
- BLINKER-64 is not just another simple merge, append or renumber utility (it makes the majority of these immediately obsolete). BLINKER-64 always produces a correctly numbered program regardless of the line numbers used in the source modules.

Educational use of BLINKER-64

We believe that BLINKER-64 will be of great value in the production of BASIC programs in the field of education. It encourages the use of modular programming techniques and top-down design methods.

It enables class projects to be undertaken with individual students or groups of students being responsible for the design, coding, entry and debugging of their own parts of a large program.

Advantages of using BLINKER-64

- One of the most important features of modern programming languages (including assembly languages) is the ability to refer to library subroutines saved on disk. BLINKER-64 provides Commodore 64 BASIC with this facility.
- Subroutines developed for one program can easily be included in others, reducing the effort spent reinventing and re-entering them.
- Small source modules are easier to enter, edit and debug then large, complete programs.
- Program development time is substantially reduced.
- As a library of subroutines grows (whether you write or collect them) so your ability to produce more sophisticated programs increases.
- Your ability to construct non-trivial programs will increase the satisfaction you gain from programming your computer.
- You will be able to make proper use of your investment in a disk drive for developing programs rather than using it as a cassette deck replacement.

Availability of BLINKER-64

BLINKER-64 is available directly from INDEV. It is supplied under the terms of a Single User Licence agreement which enables you to use BLINKER-64 for your own purposes and to make copies of the disk on which it is supplied for back-up purposes only.

The package we send you contains a copy of the licence for you to sign and return together with full documentation and the BLINKER-64 program disk whcih is enclosed in a sealed wrapper.

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DENISE also contains the sprite registers. There are 16 of these controlling eight sprites with a definition of 16 pixels with four colours. The sprites can be defined without size boundaries in the vertical plane and can be re-used without any restrictions. Sprite data can placed and fetched from anywhere in primary RAM. The degree of user control over the hardware sprites is unmatched by any machine yet available.

AGNUS is probably the most versatile of the special circuits in AMIGA, controlling no less than 25 direct memory access (DMA) channels. This means less traffic jams between the 68000 cpu and the rest of the hardware.

Inside AGNUS lie the two features that give the strength to the graphics of AMIGA, namely the BLITTER, and COPPER or co-processor. The COPPER manipulates data in or out of virtually every register within the AMIGA. There are only three instructions to control the COPPER and this makes for simple but versatile programming. It is the COPPER that keeps track of the x and y co-ordinates of the display beam position and this is used extensively in the 'hold and modify' technique. The wait instruction of COPPER is related to the display beam position and since this allows very accurate timing almost any activity within AMIGA can be closely related to another activity based on a position on the screen. However, the real star of AGNUS or the AMIGA for that matter is the BLITTER.

Powerful Graphics Engine

The BLITTER is a very powerful graphics engine and provides much of the strength of the AMIGA in terms of graphics. Like the COPPER, the BLITTER is simple to program and even more devastating in the results. Data anywhere in memory can be swept up and dropped anywhere in memory. So what you ask? If I said that this data could be swept up ascending or descending in memory and laid back down in a user-defined pattern or if I said that there are no restrictions on the size of the data provided it was in primary RAM or if I said that the BLITTER did not in any way affect the running the 68000 cpu, still not impressed? Try this: the BLITTER can execute these instructions TEN TIMES FASTER than the same instructions given to the 68000 cpu. In other words the BLITTER could be likened to a 68000 running at 70 MHz. It is this feature of the AMIGA that provides the speed of animation and kills stone-dead the competition of the Atari 520ST and Mackintosh.

The ability of the AMIGA to multi-task is not difficult to understand when you realise that for 50% of its existence the 68000 is doing nothing. The 68000 only runs on alternate clock cycles thus leaving the memory bus free on every odd clock cycle.

The design of the AMIGA hardware is such that it allows for an interleave between the 68000 cpu and the special circuits. This gives full steam to the cpu and the special circuits. There are occasions when clock cycles are 'stolen' from the 68000 but the overiding consideration in the design of the AMIGA was given to selection of the best piece of hardware to carry out the prevailing function rather than the conventional PC dictate of letting the cpu believe "l' etat c'est moi" or assume it is the lynchpin all of the time.

Interesting Keyboard

The keyboard on the AMIGA is interesting since it contains a dedicated microprocessor. This is a 6500/1 cpu containing 64 bytes of RAM, a 2k ROM and four I/O ports 8-bits wide. During the power-up sequence, the 6500/1 keyboard cpu does ROM checksum test, RAM test and then attempts to synchronise with the AMIGA itself. After this has been achieved the 6500/1 signals the 68000 that all is well within the keyboard and the power-up sequence continues within the AMIGA. If the keyboard self-test fails for any reason this is communicated to the user by the CAPS LOCK key LED blinking. The blink sequence indicates the type of keyboard failure, one blink indicates ROM failure two blinks RAM failure, three blinks timer failure and four blinks keyboard line short circuit. The blink cycle is rated at one second intervals.

Although there appears to be a number of symbols missing from the keyboard on my own AMIGA which is a North American specification, these can be accessed very easily through the use of the ALT key. For instance the "£" symbol, the copywrite symbol (the circle with a small "c" inside), accented letters, and the registered mark (small "r" in a circle) are all present in the keyboard.

Printers are very well supported by the AMIGA. By this I mean that as the machine comes out of the box it will directly drive the following printers:-

1. Epson X80-series e.g. MX80, RX80, FX80 including the JX80 colour printer.
2. Alphacom PRO101
3. Brother HX-15XL
4. Diablo 630
5. Diablo Advantage D25 daisywheel
6. Qume 630
7. Qume LetterPro 20 daisywheel
8. Okimate 20 colour printer
9. Diablo C-150 colour ink jet
10. Commodore MPS1000
11. Hewlett Packard LaserJet

Cabels for the printers are not supplied and for my own RX80 F/T I had to make up the cable. The information to do this is shown none to clearly in the manuals and it is a pretty boring pastime soldering 50 cable ends to very small pins. The connectors and screened cable are readily available from MAPLINS. Additional printers ie those not specified in the above list would have to have software created for them.

Future Thinking

The floppy disk drive port on the AMIGA provides some fascinating glimpses into future thinking at Commodore. Notwithstanding slow operational speeds the whole question of disk formats has been unsatisfactory to owners and software procedures alike. Thankfully, there appear to be others within Commodore with the same idea and the 1570-series of disk drives are a step in the right direction. However, if the 1570-series puts a crack in the mould of Commodore's obsession with GCR disk format then the AMIGA's disk drives finally smash it into well deserved smithereens.

The disk I/O port is controlled through two 8520 CIA circuits. The drives that used with the AMIGA are non-intelligent devices and are therefore under software control in terms of disk format. The AMIGA can support a maximum of four floppy disk drives, but since one drive is internal the practical number is 3. These can be either 3.5" or 5.25" units and the coupling method is by daisychain. However, there is a restriction on the power available at the disk port and daisychaining more than one drive is not recommended unless additional separate power is made available to the drive. The AMIGA 5.25" drive (which looks remarkably like the 1571) has its own power supply and represents the easiest way of attaching more than one external drive.

The disk controller of the AMIGA is capable of reading or writing either GCR or MFM formats which is very good news for users. It means that, given a software emulation package, the drives will read or write to any disk format. I feel that this particular facility has not received the exposure it deserves. It could mean for instance that all of your 1541/4040/8250 Superbase or Superscript files could be mounted into the AMIGA using the 5.25" AMIGA drive without the need for tedious keyboard re-entry. This assumes of course that Messrs Precision will provide software to do this. Similarly, it provides the means of providing a cross-compiler for all of the 8-bit Commodore machines. It could work by using the AMIGA to emulate say a C64 or C128 and then directly reading and writing 1541/1571 format disks.

I hope that I have given you a brief taste of the abilities of the remarkable AMIGA. There's a lot more to come yet.

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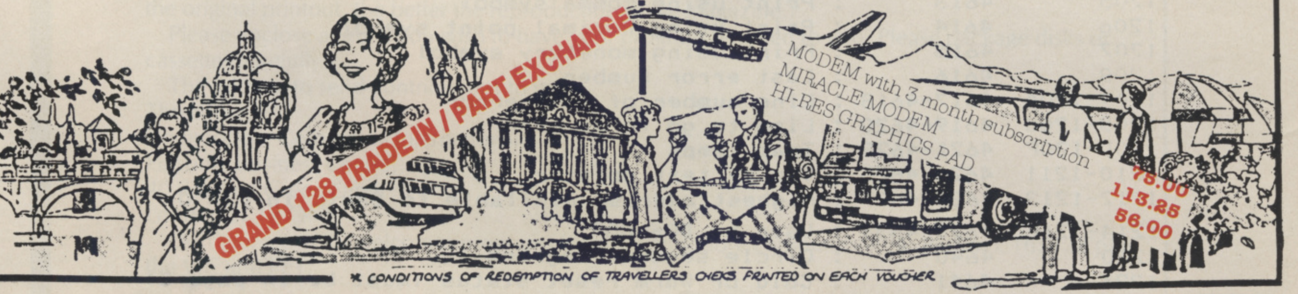

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COMMODORE 128 MEMORY MAP (128 MODE)

Here is part three of the Commodore 128 Memory map covering memory locations $1000 (4096) to $8000 (32768). This months map bears no resemblance to the C-64's whatsoever, we are now well and truly in 128 mode. This section of memory is used almost exclusively by the Hi-res and music commands offered by the 128. Locations $1000 (4096) to $10FF (4351) contain the function key strings and length tables. Next month's map will start at $AF00, being the next area of interest.

```
HEX         DECIMAL

1000-1009   4096-4105 : Function, shift/run & help key length table
100A-10FF   4106-4351 : Programmable function key strings
1100-1130   4352-4400 : Dos output string buffer (48 bytes)
1131-1132   4401-4402 : Hi-res Current x position
1133-1134   4403-4404 : Hi-res Current y position
1135-1136   4405-4406 : Hi-res X-coordinate destination
1137-1138   4407-4408 : Hi-res Y-coordinate destination
1139-114F   4409-4431 : Hi-res Line drawing variables
1150-1151   4432-4433 : Hi-res Circle centre x-coordinate
1152-1153   4434-4435 : Hi-res Circle centre y-coordinate
1154-1155   4436-4437 : Hi-res Circle x-radius
1156-1157   4438-4439 : Hi-res Circle y-radius
1158-115B   4440-4443 : Hi-res Circle Rotation angle
115C-115D   4444-4445 : Hi-res Circle arc angle start
115E-115F   4446-4447 : Hi-res Circle arc angle end
1160-1161   4448-4449 : Hi-res Circle x-radius * cos
1162-1163   4450-4451 : Hi-res Circle y-radius * sin
1164-1165   4452-4453 : Hi-res Circle x-radius * sin
1166-1167   4454-4455 : Hi-res Circle y-radius * cos
1168        4456      : Hi-res High byte of address of char rom for CHAR
1169        4457      : Hi-res Temp for GSHAPE
116A        4458      : Hi-res Scale mode flag
116B        4459      : Hi-res Double width flag
116C        4460      : Hi-res Box fill flag
116D        4461      : Hi-res Temp for bit mask
116E        4462      : ?
116F        4463      : Trace mode flag
1170-1176   4464-4470 : Renumber temps
1177-1179   4471-4473 : Graphic temps
117A-117D   4474-4477 : Pointer to floating/integer convert routines
117E-11D5   4478-4565 : Sprite speed/direction tables (88 bytes)
11D6-11EA   4566-4586 : Copy of vic registers used to update chip (21 bytes)
11EB        4587      : Pointer to upper/lower character set for CHAR
11EC        4588      : Pointer to upper/graphic character set for CHAR
11ED-11FF   4589-4607 : Temp storage for RECORD command
1200-1201   4608-4609 : Previous BASIC line number
1202-1203   4610-4611 : Pointer: BASIC statement for CONTINUE
1204        4612      : Print using fill symbol
1205        4613      : Print using comma symbol
1206        4614      : Print using Decimal point symbol
1207        4615      : Print using monetary symbol
1208        4616      : Last error number
1209-120A   4617-4618 : Line number of last error
120B-120C   4619-4620 : Line to go to on error
120D-120F   4621-4623 : Trap temps
1210-1211   4624-4625 : Top of text pointer
1212-1213   4626-4627 : Highest address available to Basic in ram 0
1214-121F   4628-4639 : Used by DO-LOOP
1220        4640      : Circle segment degrees
1221        4641      : Cold or Warm reset status (must be in page 5)
1222        4642      : Play Tempo rate
1223-1228   4643-4648 : Play Voices
```

```
1229-122A  4649-4650 : Play Ntime
122B       4651      : Play Octave
122C       4652      : Play Sharp
122D-122E  4653-4654 : Play Pitch
122F       4655      : Play Voice
1230-1232  4656-4658 : Play Waveform
1233       4659      : Play Dnote
1234-1238  4660-4664 : Play Filter data
1239-123D  4665-4669 : Play Envelope data
123E       4670      : Play Parcnt ?
123F-1248  4671-4680 : Play Attack table ?
1249-1252  4681-4690 : Play Sustain table ?
1253-125C  4691-4700 : Play Waveform table ?
125D-1266  4701-4710 : Play Pulse width lo
1267-1270  4711-4720 : Play Pulse width hi
1271-1275  4721-4725 : Play Filters
1276-1280  4726-4736 : Play Interrupt data
1281       4737      : Sound Voice
1282-1284  4738-4740 : Sound Time lo
1285-1287  4741-4743 : Sound Time hi
1288-128A  4744-4746 : Sound Max lo
128B-128D  4747-4749 : Sound Max hi
128E-1290  4750-4752 : Sound Min lo
1291-1293  4753-4755 : Sound Min hi
1294-1296  4756-4758 : Sound Direction
1297-1299  4759-4761 : Sound Step lo
129A-129C  4762-4764 : Sound Step hi
129D-129F  4765-4767 : Sound Freq lo
12A0-12A2  4768-4770 : Sound Freq hi
12A3-12B0  4771-4784 : Sound temps
12B1-12B2  4785-4786 : Pot temps
12B3-12B6  4787-4790 : Window temps
12B7-12FC  4791-4860 : Used by SPRDEF & SAVSPR
12FD-12FF  4861-4863 : Used by BASIC IRQ to block all but one IRQ call
1300-17FF  4864-6143 : Unallocated absolute RAM-reserved for System
1800-1BFF  6144-7167 : Reserved for function key software applications
1C00-FBFF  7168-64511: Basic text (lo-res)
2000-3FFF  8192-16383: Hi-res screen (Basic then starts at $4000/16384)
4000-CFFF 16384-53247: BASIC ROM
4000-4002 16384-16386: Rom cold entry
4003-4005 16387-16389: Rom warm entry
4006-4008 16390-16392: Rom irq entry
```

ATTENTION ALL PROGRAMMERS!!

You may be an experienced programmer – you may be a beginner. Either way, you may have come across some useful tips which could make life easier for other CCI readers.

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Avoiding Tedious Data Statements

If your involvement with your Commodore 64 includes the use of Machine Code in conjunction with BASIC then this is THE program for you! Preparation of your Machine Code programs may be done using a simple Monitor or a full-blown Assembler Development System including Editor, Assembler, Loader and Monitor. When the Machine Code is fully developed you are faced with the task of converting it to a list of DATA statements which can be POKEd into memory using a small BASIC loader (usually) at the start of your main program. The conversion of the Machine Code is a boring and time consuming process especially if you find a "bug" in the program as soon as you have done it!

DATAGEN is a Machine Code program which converts any area of memory (usually another Machine Code program) into a list of DATA statements which are appended to the BASIC program (usually a loader) in memory.

Conversion of Machine Code into data statements can be boring and time consuming. Datagen from Barry Parkes was written to ease this task.

How to use DATAGEN

STEP 1. Write and debug your Machine Code program in the usual way. Save a copy to either tape or disk (this will save you hours of heartache should anything go wrong), then load it into RAM (usually, but not necessarily at location C000)

STEP 2. LOAD "DATAGENLOAD", 8 from disk or cassette (omit ,8) in the usual way.

STEP 3. RUN the program to deposit the Machine Code DATAGEN into RAM. It occupies locations CED0 to CFE7 Hexadecimal.

STEP 4. Type NEW then load your debugged BASIC loader program. Or any other BASIC program to which you want the DATA statements appended.

STEP 5. Type SYS 52944,S,E,L where:

S = Address of first Machine Code Location

E = Address of last Machine Code Location

L = Line number of first DATA statement

STEP 6. On completion of the coversion process (allow about 20sec per 1K of memory) the screen will display CLR and READY. You can then SAVE the program to disk or tape in the usual way.

List the program – now hasn't that saved you a lot of time!! and there are no errors in the DATA.

Before using DATAGEN you will have to type in the "DATAGENLOAD" program provided in LISTING 1. I didn't have to do this, of course, I used DATAGEN!

The loader is simple but there is a lot of it. Anybody who doesn't want the tedium of typing it all in is welcome to write to me via CCI enclosing a disk or cassette and I will supply a copy for a nominal fee.

How it Works

The CBM 64 stores BASIC programs in a compacted form using "Tokens" for keywords such as PRINT, REM, DATA, GOTO etc. Each line of BASIC starts with a two-byte link address (which points to the next line of code) then a two-byte line number followed by the rest of the text. Each line is terminated by an additional pair of zero bytes (where the next link address would be).

DATAGEN finds the end of the current program (if there is one present) then appends DATA statements to it. On entry (using SYS) the calling line is first analysed and the parameters are stored. Be careful, as no checks for range or the fact that the end address must be greater than the start address are made.

A dummy link address is first set up, followed by the BASIC line number, a DATA token and a space character. Each Machine Code byte is then coverted to a string of Ascii digits (using routines called from the BASIC ROM) and these are appended to the line. Each set of digits is terminated by a comma to separate each location from the next. A sumcheck is accumulated by adding up the values of the eight numbers on each line and this total is output as the last item on the line. Every line is terminated by a zero byte.

When all Machine Code locations have been processed, a -1 is output to terminate the string of data. The final sumcheck is then output followed by the two-byte program terminator. The BASIC variables pointer (VARTAB) is updated to reflect the increased program length, then all the BASIC program lines are re-chained (ie the link addresses are re-calculated) by calling a subroutine resident in the BASIC ROM.

Finally a CLR command is loaded into the keyboard buffer and then a return is made to BASIC. This CLR command ensures that all pointers are reset prior to the extended program being ran or saved.

LISTING 2 is provided for those people who have their own Assembler Development facilities or who are just interested in the detail of the program.

Apart from the fact that DATAGEN is a useful program, it does contain some techniques which can be very useful for other projects. The parameter passing via the SYS line is particularly useful as is the integer to string conversion and the loading of the keyboard buffer.

Hints

1. Keep a copy of your BASIC loader without the DATA statements. Any modifications to the Machine Code can then be quickly implemented by re-running DATAGEN. This is not important if you have a method of deleting lines of BASIC without having to erase them individually.

2. DATAGEN occupies memory at the very top of the 4K RAM area (C000 to CFFF) which is not used by BASIC. This leaves plenty of space from C000 upwards for your own Machine Code programs.

3. DATAGEN can, of course, be used to generate data in any part of memory from BASIC and can even be used to move blocks of data if required.

4. DATAGEN was used to create its own loader as in LISTING 1. Lines 230 to 370 can be used to load any program processed by DATAGEN provided MC and LN are changed to suit. This routine also makes use of the sumcheck facility as added security. As we all know, one byte – or even bit – wrong in a Machine Code program can be disastrous.

```
100 REM ******************************
110 REM *                            *
120 REM *          LISTING  1        *
130 REM *                            *
140 REM *    *** DATAGEN LOAD ***    *
150 REM *                            *
160 REM *    BARRY PARKES  JAN 86    *
170 REM *                            *
180 REM ******************************
190 REM
200 REM THIS PROGRAM LOADS THE "DATAGEN"
210 REM MACHINE CODE INTO RAM.
220 REM
230 PRINT "♥QQQQQ"
240 PRINT SPC(3) "LOADING MACHINE CODE": PRINT
250 MC=52944: RL=0: LN=500
260 SC=0: FOR I=0 TO 7: READ D
270 IF D<0 GOTO 340
280 IF D>255 GOTO 330
290 POKE MC+RL,D: SC=SC+D: RL=RL+1: NEXT I
300 READ D: IF D<0 GOTO 340
310 IF SC=D THEN LN=LN+10: GOTO 260
320 PRINT "SUMCHECK ";
330 PRINT "ERROR IN LINE";LN: GOTO 380
340 READ D: IF SC<>D GOTO 320
350 PRINT: PRINT SPC(8) "LOADED": PRINT
360 PRINT "TO USE, TYPE THE FOLLOWING:": PRINT
370 PRINT "      SYS 52944,START,END,LINE": PRINT
380 END
390 REM
400 REM MACHINE CODE DATA FOLLOWS
410 REM
500 DATA 32,172,207,132,251,133,252,32,1211
510 DATA 172,207,132,253,133,254,32,172,1355
520 DATA 207,132,28,133,29,32,51,165,777
530 DATA 165,34,133,26,165,35,133,27,718
540 DATA 56,165,28,233,10,133,28,165,818
550 DATA 29,233,0,133,29,169,8,133,734
560 DATA 32,169,0,133,30,133,31,133,661
570 DATA 33,169,255,32,182,207,32,182,1092
580 DATA 207,24,165,28,105,10,133,28,700
590 DATA 165,29,105,0,133,29,165,28,654
600 DATA 32,182,207,165,29,32,182,207,1036
610 DATA 169,131,32,182,207,169,32,32,954
620 DATA 182,207,24,160,0,177,251,101,1102
630 DATA 30,133,30,165,31,105,0,133,627
640 DATA 31,177,251,162,0,32,194,207,1054
650 DATA 169,44,32,182,207,165,251,197,1247
660 DATA 253,208,28,165,252,197,254,208,1565
670 DATA 22,169,45,32,182,207,169,49,875
680 DATA 32,182,207,169,44,32,182,207,1055
690 DATA 133,33,208,13,76,253,206,230,1152
700 DATA 251,208,2,230,252,198,32,208,1381
710 DATA 185,165,30,166,31,32,194,207,1010
720 DATA 169,0,32,182,207,165,33,240,1028
730 DATA 227,169,0,32,182,207,32,182,1031
740 DATA 207,165,26,133,45,165,27,133,901
750 DATA 46,32,51,165,160,0,185,228,867
760 DATA 207,153,119,2,200,192,4,208,1085
770 DATA 245,132,198,96,32,253,174,32,1162
780 DATA 138,173,32,247,183,96,160,0,1029
790 DATA 145,26,230,26,208,2,230,27,894
800 DATA 24,96,134,98,133,99,162,144,890
810 DATA 56,32,73,188,32,221,189,133,924
820 DATA 98,132,99,160,1,177,98,240,1005
830 DATA 10,132,100,32,182,207,164,100,927
840 DATA 200,144,242,96,67,76,82,13,-1,920

READY.
```

```
DATAGEN......PAGE 0001

LINE# LOC   CODE         LINE

00001  0000               ;        LISTING 2
00002  0000               ;
00003  0000               ;     *** DATAGEN ***
00004  0000               ;
00005  0000               ;  BARRY PARKES  JAN 86
00006  0000               ;
00007  0000               ; CALL THIS ROUTINE USING:
00008  0000               ;
00009  0000               ;        SYS 52944,S,E,L
00010  0000               ;
00011  0000               ;    WHERE S = MACHINE CODE START ADDRESS
00012  0000               ;          E =    "     "   END      "
00013  0000               ;          L = INITIAL LINE NUMBER FOR BASIC
00014  0000               ;              DATA STATEMENTS (MIN 10)
00015  0000               ;
00016  0000               ;              (ALL IN DECIMAL)
00017  0000               ;
00018  0000               ; THE ROUTINE CONVERTS A MACHINE CODE PROGRAM IN
00019  0000               ; MEMORY TO SUM-CHECKED DATA STATEMENTS APPENDED
00020  0000               ; TO A BASIC LOADER.
00021  0000               ;
00022  0000                      VARTAB=$2D       ;START OF BASIC VARIABLES
00023  0000                      KEYD=$277        ;KEYBOARD BUFFER
00024  0000                      NDX=$C6          ;NO OF KEYBOARD CHARACTERS
00025  0000                      INDEX=$22        ;END OF BASIC PTR (RCHAIN)
00026  0000                      FACHO=$62        ;FPA#1
00027  0000               ;
00028  0000                      MCADDR=$FB       ;POINTER TO MACHINE CODE
00029  0000                      LASTAD=$FD       ;LAST MACHINE CODE ADDRESS
00030  0000               ;
00031  0000               ; USE BASIC TEMP STRING STACK AS A WORK AREA
00032  0000               ;
00033  0000                      BASPTR=$1A        BASIC TEXT POINTER
00034  0000                      LINE=$1C         ;  "    LINE NUMBER
00035  0000                      SUMCHK=$1E       ;SUMCHK VALUE
00036  0000                      COUNT=$20        ;LOOP COUNT
00037  0000                      ENDFLG=$21       ;SET WHEN ALL LOCS PROCESSED
00038  0000               ;
00039  0000               ; ADDRESSES OF ROUTINES IN BASIC ROM
00040  0000               ;
00041  0000                      RCHAIN=$A533     ;RE-CHAIN BASIC LINES
00042  0000                      FLTASC=$BDDD     ;CONVERT FP TO ASCII STRING
00043  0000                      GETNUM=$AD8A     ;GET PARAMETER & CHECK NUMERIC
00044  0000                      COMNXT=$AEFD     ;CHECK COMMA AND GET NEXT CHAR
00045  0000                      FLTFIX=$B7F7     ;CONVERT FLOATING TO FP
00046  0000                      FIXFLT=$BC49     ;CONVERT INTEGER TO FP
00047  0000               ;
00048  0000               ; ENTRY POINT
00049  0000               ;
00050  0000                      *=$CED0
00051  CED0               ;
00052  CED0  20 AC CF    DATGEN JSR ADRES         ;EVALUATE MC START ADDRESS
00053  CED3  84 FB               STY MCADDR
00054  CED5  85 FC               STA MCADDR+1
00055  CED7  20 AC CF            JSR ADRES         ;EVALUATE END ADDRESS
DATAGEN......PAGE 0002
LINE# LOC   CODE         LINE
00056  CEDA  84 FD               STY LASTAD
00057  CEDC  85 FE               STA LASTAD+1
00058  CEDE  20 AC CF            JSR ADRES         ;DATA STATEMENT LINE NO
00059  CEE1  84 1C               STY LINE
00060  CEE3  85 1D               STA LINE+1
00061  CEE5  20 33 A5            JSR RCHAIN        ;FIND PROGRAM END
00062  CEE8  A5 22               LDA INDEX         ;SAVE LINK ADDRESS
00063  CEEA  85 1A               STA BASPTR
00064  CEEC  A5 23               LDA INDEX+1
00065  CEEE  85 1B               STA BASPTR+1
00066  CEF0  38                  SEC               ;SUBTRACT 10 FROM LINE NO
00067  CEF1  A5 1C               LDA LINE
00068  CEF3  E9 0A               SBC #10
00069  CEF5  85 1C               STA LINE
00070  CEF7  A5 1D               LDA LINE+1
00071  CEF9  E9 00               SBC #0
00072  CEFB  85 1D               STA LINE+1
00073  CEFD               ;
00074  CEFD               ; MAIN LINE LOOP
```

```
00075  CEFD                ;
00076  CEFD  A9 08         STRLIN LDA #8          ;SET COUNT
00077  CEFF  85 20                STA COUNT
00078  CF01  A9 00                LDA #0
00079  CF03  85 1E                STA SUMCHK      ;RESET SUMCHECK
00080  CF05  85 1F                STA SUMCHK+1
00081  CF07  85 21                STA ENDFLG      ;RESET END FLAG
00082  CF09  A9 FF                LDA #$FF        ;DUMMY BYTES FOR LINK ADDRESS
00083  CF0B  20 B6 CF             JSR STRCHR
00084  CF0E  20 B6 CF             JSR STRCHR
00085  CF11  18                   CLC             ;ADD 10 TO LINE NO
00086  CF12  A5 1C                LDA LINE
00087  CF14  69 0A                ADC #10
00088  CF16  85 1C                STA LINE
00089  CF18  A5 1D                LDA LINE+1
00090  CF1A  69 00                ADC #0
00091  CF1C  85 1D                STA LINE+1
00092  CF1E  A5 1C                LDA LINE        ;STORE IN BASIC TEXT BUFFER
00093  CF20  20 B6 CF             JSR STRCHR
00094  CF23  A5 1D                LDA LINE+1
00095  CF25  20 B6 CF             JSR STRCHR
00096  CF28  A9 83                LDA #$83        ;DATA TOKEN
00097  CF2A  20 B6 CF             JSR STRCHR
00098  CF2D  A9 20                LDA #$20        ;SPACE
00099  CF2F  20 B6 CF             JSR STRCHR
00100  CF32                ;
00101  CF32  18            LNLOOP CLC             ;GET MACHINE CODE BYTE
00102  CF33  A0 00                LDY #0
00103  CF35  B1 FB                LDA (MCADDR),Y
00104  CF37  65 1E                ADC SUMCHK
00105  CF39  85 1E                STA SUMCHK
00106  CF3B  A5 1F                LDA SUMCHK+1
00107  CF3D  69 00                ADC #0
00108  CF3F  85 1F                STA SUMCHK+1
00109  CF41  B1 FB                LDA (MCADDR),Y  ;CONVERT MACHINE CODE
00110  CF43  A2 00                LDX #0          ;BYTE TO ASCII AND STORE

DATAGEN......PAGE 0003
LINE# LOC   CODE         LINE
00111  CF45  20 C2 CF             JSR INTASC
00112  CF48  A9 2C                LDA #$2C        ;STORE COMMA
00113  CF4A  20 B6 CF             JSR STRCHR
00114  CF4D  A5 FB                LDA MCADDR      ;CONVERTED ALL LOCATIONS ?
00115  CF4F  C5 FD                CMP LASTAD
00116  CF51  D0 1C                BNE CHKLP
00117  CF53  A5 FC                LDA MCADDR+1
00118  CF55  C5 FE                CMP LASTAD+1
00119  CF57  D0 16                BNE CHKLP
00120  CF59  A9 2D                LDA #$2D        ;YES - STORE MINUS SIGN
00121  CF5B  20 B6 CF             JSR STRCHR
00122  CF5E  A9 31                LDA #$31        ;STORE 1
00123  CF60  20 B6 CF             JSR STRCHR
00124  CF63  A9 2C                LDA #$2C        ;STORE COMMA
00125  CF65  20 B6 CF             JSR STRCHR
00126  CF68  85 21                STA ENDFLG      ;SET FLAG
00127  CF6A  D0 0D                BNE OPSUM       ;ALWAYS
00128  CF6C                ;
00129  CF6C  4C FD CE      LNKLIN JMP STRLIN      ;JUMP LINK
00130  CF6F                ;
00131  CF6F  E6 FB         CHKLP  INC MCADDR      ;INC MACHINE CODE POINTER
00132  CF71  D0 02                BNE OVL
00133  CF73  E6 FC                INC MCADDR+1
00134  CF75  C6 20         OVL    DEC COUNT       ;DONE 8 LOCATIONS ?
00135  CF77  D0 B9                BNE LNLOOP
00136  CF79                ;
00137  CF79  A5 1E         OPSUM  LDA SUMCHK      ;YES - STORE SUMCHECK
00138  CF7B  A6 1F                LDX SUMCHK+1
00139  CF7D  20 C2 CF             JSR INTASC
00140  CF80  A9 00                LDA #0          ;STORE LINE TERMINATOR
00141  CF82  20 B6 CF             JSR STRCHR
00142  CF85  A5 21                LDA ENDFLG      ;DONE ALL ?
00143  CF87  F0 E3                BEQ LNKLIN
00144  CF89  A9 00                LDA #0          ;YES - STORE PROGRAM TERMINATOR
00145  CF8B  20 B6 CF             JSR STRCHR
00146  CF8E  20 B6 CF             JSR STRCHR
00147  CF91  A5 1A                LDA BASPTR      ;RE-SET VARIABLES POINTER
00148  CF93  85 2D                STA VARTAB
00149  CF95  A5 1B                LDA BASPTR+1
00150  CF97  85 2E                STA VARTAB+1
00151  CF99  20 33 A5             JSR RCHAIN      ;RE-CHAIN BASIC LINES
00152  CF9C  A0 00                LDY #0          ;TRANSFER CLR COMMAND
```

```
00153  CF9E  B9 E4 CF    MSGLP  LDA MSG,Y         ;TO KEYBOARD BUFFER
00154  CFA1  99 77 02           STA KEYD,Y
00155  CFA4  C8                 INY
00156  CFA5  C0 04              CPY #4
00157  CFA7  D0 F5              BNE MSGLP
00158  CFA9  84 C6              STY NDX           ;SET CHARACTER COUNT
00159  CFAB  60                 RTS               ;EXIT TO BASIC
00160  CFAC              ;
00161  CFAC               THE SUBROUTINES
00162  CFAC
00163  CFAC              ;
00164  CFAC              ; SUBROUTINE TO SCAN INPUT LINE AND EVALUATE
00165  CFAC              ; ENTRY PARAMETERS. ON EXIT A = MSB, Y = LSB
DATAGEN......PAGE 0004

LINE# LOC   CODE         LINE
00166  CFAC              ;
00167  CFAC  20 FD AE    ADRES  JSR COMNXT        ;CHECK COMMA AND GET NEXT CHAR
00168  CFAF  20 8A AD           JSR GETNUM        ;EVALUATE PARAMETER
00169  CFB2  20 F7 B7           JSR FLTFIX        ;CONVERT TO DL INTEGER
00170  CFB5  60                 RTS               ;RETURN
00171  CFB6              ;
00172  CFB6              ;
00173  CFB6              ; SUBROUTINE TO STORE A BYTE IN THE BASIC TEXT
00174  CFB6              ; BUFFER AND INCREMENT THE TEXT POINTER.
00175  CFB6              ;
00176  CFB6  A0 00       STRCHR LDY #0            ;SAVE BYTE
00177  CFB8  91 1A              STA (BASPTR),Y
00178  CFBA  E6 1A              INC BASPTR        ;INCREMENT POINTER
00179  CFBC  D0 02              BNE OVFL
00180  CFBE  E6 1B              INC BASPTR+1
00181  CFC0  18          OVFL   CLC
00182  CFC1  60                 RTS               ;RETURN
00183  CFC2              ;
00184  CFC2              ;
00185  CFC2              ; SUBROUTINE TO CONVERT A DOUBLE LENGTH INTEGER TO
00186  CFC2              ; AN ASCII STRING AND STORE IT IN THE BASIC TEXT
00187  CFC2              ; BUFFER. ROM RESIDENT CONVERSION ROUTINES ARE
00188  CFC2              ; USED FOR THIS OPERATION.
00189  CFC2              ;
00190  CFC2              ; ENTRY WITH X=MSB, A=LSB
00191  CFC2              ;
00192  CFC2  86 62       INTASC STX FACHO         ;SAVE MSB IN FAC#1
00193  CFC4  85 63              STA FACHO+1       ;SAVE LSB
00194  CFC6  A2 90              LDX #$90
00195  CFC8  38                 SEC
00196  CFC9  20 49 BC           JSR FIXFLT        ;CONVERT INTEGER TO FP
00197  CFCC  20 DD BD           JSR FLTASC        ;CONVERT TO ASCII STRING
00198  CFCF  85 62              STA FACHO         ;ADDR OF STRING - LSB
00199  CFD1  84 63       STY    FACHO+1           ;MSB
00200  CFD3  A0 01              LDY #1            ;LOSE SIGN
00201  CFD5  B1 62       NXT    LDA (FACHO),Y     ;GET CHARACTER
00202  CFD7  F0 0A              BEQ ALL           ;CHECK FOR TERMINATOR
00203  CFD9  84 64              STY FACHO+2
00204  CFDB  20 B6 CF           JSR STRCHR        ;TRANSFER TO BASIC TEXT
00205  CFDE  A4 64              LDY FACHO+2
00206  CFE0  C8                 INY
00207  CFE1  90 F2              BCC NXT           ;ALWAYS
00208  CFE3  60          ALL    RTS               ;RETURN
00209  CFE4              ;
00210  CFE4              ; CONSTANTS
00211  CFE4              ;
00212  CFE4  43 4C 52    MSG    .BYTE 'CLR'       ;MESSAGE FOR KEYBOARD BUFFER
00213  CFE7  0D                 .BYTE $0D         ;RETURN CHARACTER
00214  CFE8              ;
00215  CFE8                     .END
ERRORS = 00000
SYMBOL TABLE
SYMBOL VALUE
 ADRES    CFAC    ALL      CFE3    BASPTR   001A    CHKLP    CF6F
 COMNXT   AEFD    COUNT    0020    DATGEN   CED0    ENDFLG   0021
 FACHO    0062    FIXFLT   BC49    FLTASC   BDDD    FLTFIX   B7F7
 GETNUM   AD8A    INDEX    0022    INTASC   CFC2    KEYD     0277
 LASTAD   00FD    LINE     001C    LNKLIN   CF6C    LNLOOP   CF32
 MCADDR   00FB    MSG      CFE4    MSGLP    CF9E    NDX      00C6
 NXT      CFD5    OPSUM    CF79    OVFL     CFC0    OVL      CF75
 RCHAIN   A533    STRCHR   CFB6    STRLIN   CEFD    SUMCHK   001E
 VARTAB   002D
END OF ASSEMBLY
```

3D Wire Frame Drawing

High resolution plotting of 3D shapes is made possible by this program from Garfield Davies.

This program makes use of the graphics software inherent in the Commodore 1520 Printer-Plotter, in order to give high resolution plotting of three-dimensional shapes. It gives a 3D wire frame representation of any shape which can be made by various cross-sections on a straight axis. Up to five cross-sections can be defined on the axis, and the cross-section may be circular, or square, or any polygon with a number of sides that will divide into 24.

The shape drawn can be rotated on its axis, or rotated on two other axes to give different viewing angles.

The basic shape is defined by the values R and Z in Data lines 2000 to 2040. All five lines are used if there are five elements in the shape – one element to each line. The R is the radius if the cross-section is a circle, or R is the distance from the axis to the corners if the shape is a polygon. Z is the distance of each element plane along the axis. Z can be plus or minus.

When the Shape Data lines 2000 to 2040 are defined they are initially defined along an imaginary axis coming out of the paper at right angles, with Z=0 in the plane of the paper, plus values of Z in front of the paper and minus values behind.

The orientation of the shape is determined by Data Line 1950 – this contains four angles defined as in the REM on line 1900, as TH, PH, PS, TW.

TH is the rotation of the figure side to side
PH is the rotation in a vertical plane coming in or out of the paper
PS is the rotation of the figure on its own axis
TW is "Twist". When "Twist" is set to 0, all joining lines from element to element are to corresponding points. With TW set to an angle the figure has a twist because join lines are set to join the next vertex around on the adjacent element.

Use only multiples of 15° for all angles.

When the program is run you will be asked two questions – first "How many elements?" – type in any number up to 5. For the demonstration program all five elements are used. However, calculation time is reduced if only, say, two elements are needed, (then only the first two Shape Data lines are read).

While the computer is calculating the co-ordinates of the points, the word "CALCULATING" is shown on the screen. This word is repeated for each element calculated – ie up to five times.

When all calculations have been done (it takes up to one minute) you will again see a prompt on the screen asking you to "Type in the number of sides". If you want your elements to be circular type in 24. If, however, you want a square type 4, or 6 for a hexagon and so on.

The plotter will then start plotting.

The demonstration program draws a wineglass. First time you try it type in 5 for "Number of Elements", and 24 for "Number of Sides". The program shows the glass elevated 60° above the horizontal, and rotated 15° to the left. It also has a twist which helps to distinguish the front faces from rear faces. Try altering the Data line 1950 to give different viewing angles.

Note! If you use a figure where Z's are positive remember to advance the paper out of the printer 3 inches before you start plotting. Remember 100 units represents about 1 inch on paper.

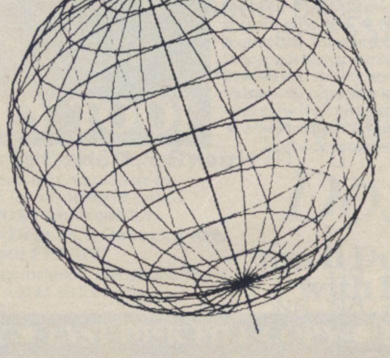
Colour:- as the program is written, it will draw in black. If you wish any other colour change the second figure on line 800: eg to draw in red write 800 PRINT #2,3

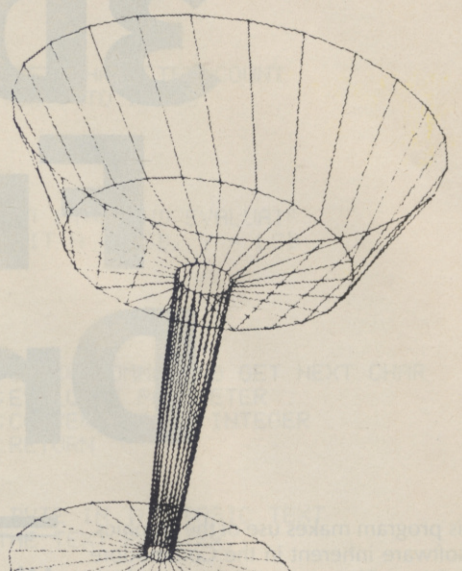
Portability:- since the program is written in CBM Basic it should work with any Commodore having a serial output capable of feeding the 1520 printer. Remember though, if you use a VIC 20 you will need at least 3K of memory expansion.

Sphere

There are 15 elements in the sphere-taken in 3 lots of 5.
The axis is of 2 elements 1 *side*

Remember when you build up a shape like this with successive runs:
A. Make the last element in each group and the first in the next group identical.
B. Do not move the paper between runs.





```
READY.


10 REM    "SPLINE"
11 REM
12 REM   3D WIREFRAME   GRAPHICS
13 REM   USING COMMODORE 1520
         PRINTER/PLOTTER
14 REM
15 REM GARFIELD DAVIES
16 REM 1986
18 REM
20 OPEN1,6,1
25 OPEN2,6,2
30 DIM M(5,32,2),B(5)
40 READ TH,PH,PS,TW
45 PRINT"TYPE IN NUMBER OF ELEMENTS-NE"
46 INPUT"NE=";NE
50 FOR N= 1 TO NE
110 READ R,Z
115 B(N)=PS/15+(N-1)*TW/15
116 PRINT"CALCULATING"
120 FOR I=0 TO 31
130 X=R*COS(I*π/12)
140 Y=R*SIN(I*π/12)
150 XT=X
160 YT=Y*COS(PH*2*π/360)+Z*SIN(PH*2*π/36
0)
190 XU=XT*COS(TH*2*π/360)-YT*SIN(TH*2*π/
360)
191 YU=XT*SIN(TH*2*π/360)+YT*COS(TH*2*π/
360)
192 XX=XU+240
193 YY=YU
200 M(N,I,0)=XX
210 M(N,I,1)=YY
220 NEXT I
230 NEXT N
700 PRINT"TYPE IN NUMBER OF SIDES UP TO
24"
710 INPUT"N=";N
720 A=24/N
800 PRINT#2,0
1000 FOR N=1 TO NE
1010 FOR I=B(N) TO (24-A+B(N)) STEP A
1015 PRINT#1,"M",M(N,I,0),M(N,I,1)
1020 PRINT#1,"D",M(N,I+A,0),M(N,I+A,1)
1030 NEXT I
1040 NEXT N
1050 IF NE=1 GOTO 3000
1060 FOR H=B(1) TO (24-A+B(1)) STEP A
1070 PRINT#1,"M",M(1,H,0),M(1,H,1)
1080 J=H+TW/15
1090 FOR  N=2 TO NE
1100 PRINT#1,"D",M(N,J,0),M(N,J,1)
1110 J=J+TW/15
1120 NEXT N
1130 NEXT H
1900 REM  TH PH PS TW
1950 DATA 15,60,00,15
1999 REM    R     Z
2000 DATA 100,-140
2010 DATA 010,-120
2020 DATA 020, 100
2030 DATA 100, 120
2040 DATA 150, 220
3000 PRINT#1,"H"
3100 PRINT#2,0
5000 END
5100 REM DATA HAS R=RADIUS OF
  CIRCLE DEFINING EACH ELEMENT
5200 Z=POSITION OF ELEMENT ON
  AXIS + OR - FROM CENTRAL POINT
5300 TH IS ANGLE OF ROTATION OF
  FIGURE|FROM SIDE TO SIDE
5400 PH IS ANGLE OF TILT IN FRONT
  TO BACK DIRECTION
5500 PS IS ANGLE OF ROTATION ON
  AXIS
5600 TW IS ANGLE OF TWIST FROM
  ELEMENT TO ELEMENT
5700 ALL ANGLES ARE IN DEGREES-USE
  ONLY MULTIPLES OF 15 DEG.
6000 NOTE PROGRAMME TAKES UP TO
  A MINUTE TO APPEAR
6100 THE WORD-CALCULATING-WILL
  APPEAR AS DATA FOR EACH STAGE
  IS CALCULATED

READY.

H
```

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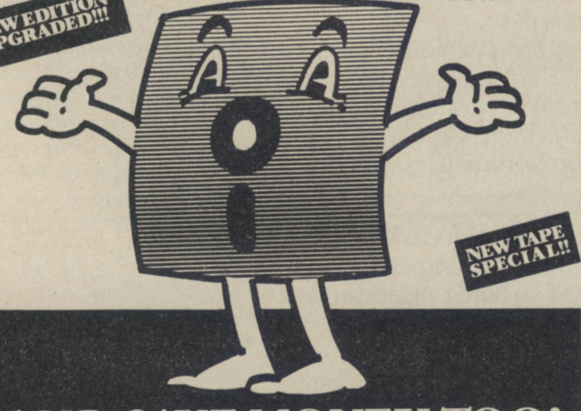

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Utilities

Over the next two months we are focussing on those little-talked about, but much-used range of utilities

Making the most of YOUR micro is really what computing is all about. It is irrelevant what each individual sees as his ultimate goal in computing, as long as his computer does its best to help him reach it.

To some it will be enough to beat every high score on every game they play. Others will need to have explored the inner working of their computer, and will not rest until they feel they have grasped everything there is to know. Both these extremes, and the people in the middle, look at the computer really as a challenge. As such, utilities are one of the ways of easing the burden of the challenge.

Probably the biggest market for utility manufacturers is in disk and tape back-up tools. With each new program a new method is needed to create a 'back-up'. Also related to this field is the need of disk-drive owners to convert all their tape based software onto disk. Programs such as Evesham Micro's 'Freeze Frame' have sold in large quantities to this market.

Again on the more serious side there are assemblers and dissassemblers to help programmers delve further into the world of machine code. Machine code programmers are not the only ones who can benefit from utilities, even the beginner in Basic will learn more with the use of products such as Information Development's Blinker, which allows two or more basic programs to be joined as one.

For the punter who really wants one utility that will ease a great deal of his problems, cartridges – more often than not – turn out to be the answer. Proof of the sucess of these products is obvious with the Final Cartridge selling well, as too are Robtek's utility cartridge range.

Another big selling utility in the Commodore 64 marketplace is the Disk turbo loaders. Due to the ridiculous slowness of the 1541, the market for products to speed up the loading and saving of programs has understandably grown greatly.

On the more jovial, if not less important side, we have products such as Robtek's Game Killer (reviewed elsewhere in this issue) which enables avid games players to complete more games than they have ever before. I was especially impressed when this product allowed me to finish Beach Head II, no mean feat.

In conclusion it is obvious that to really 'Get the Best' from your Commodore you must be willing to accept products that take a great deal of the mundane tasks away from you – the operator. Having done so, you can concentrate more on learning to understand what you can do to make them redundant. Many people believe that using utilities is apropos to cheating. Realistically, it is more use than spending many frustrating hours unsuccessfully trying to achieve your desired result.

This month's checklist will show you what a wide variety of utilities are available, and who makes them, the rest – as they say – is up to YOU!!!

SPEED LOADERS

Product	Features	Machine	Price	Company
Epyx Fast Load Cartridge	Has disk tools e.g. directory, return to basic function, copy (another menu). Can be disengaged without turning off machine. Can adit disks, has a file utility, For trans-programming you have S.Mon. which is a powerful monitor. Numbers may be entered in hex.	64, 128	£24.95	Centresoft
Robcom Turbo range	Alignment tape kit included in package. 8 pre-programmed function keys. 16 different tape and disk commands. Conversion of all graphic and control codes into readable text. Re-set switch.	64, 128	From £24.95 to £39.95	ROBTEK
GTL 1	This cartridge enables your 1541 disk drive to load 4-5 times faster. Many useful features including abbreviated load/save commands and unique on/off switching etc. Designed to work with most games.	64	£20.00	Trilogic
GTL 2	As above with built-in reset switch	64	£22.00	Trilogic

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Turbo Nibbler 4.0	Completely sync orientated..
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Turbo Nibbler 4.0	Has an integrated disk scan, for half tracks, speed and sync check. This is why Turbo Nibbler 4.0 can be used by anyone!
Turbo Nibbler 4.0	Is operable by following a simple menu.
Turbo Nibbler 4.0	Is indispensable for making your security copy.
Turbo Nibbler 4.0	Has an update service at a cost of five pounds, with the return of your disk.
Turbo Nibbler 4.0	Reviewed in the German magazines RUN October 1985 and 64'er.
Turbo Nibbler 4.0	Turbo Nibbler Can be used with a Commodore 64 and a 1541 disk drive.

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Turbo 64	A disk specially formatted with the fast load feature built in. Once the disk is made it will load on any unmodified Commodore 64 and 1541 disk drive without having to load anything first. Loading time is 5 times faster and programs can be selected and run from a menu by the press of a single key. To make a Turbo 64 disk all you do is copy the programs from your source disk onto the specially formatted Turbo 64 disk using the Editor.	64	£16.99	Cockroach
Warp 5	Disk – will load any program 5 times faster than normal. Has DOS 5.1 commands e.g. type $ and get directory. Unique Header Editor. Utility to allow disk drive to play music e.g. God Save The Queen.	64, 1541	£9.95	MPS
Toolkit IV	Disk with comprehensive manual. Can recover corrupted sectors. Fast format (10 secs.) Can change about 30 parameters before format. Fast copy (full disk is under 2 minutes). Fast file copier.	64	£22.95	MPS
1541 Express	Cartridge – two leads clip inside the computer. Works with most business software.	64	£34.95	Ram

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* Note due to memory limitations ACE on the C16 and VIC20 (+8K Ram) do not have any ground objects.

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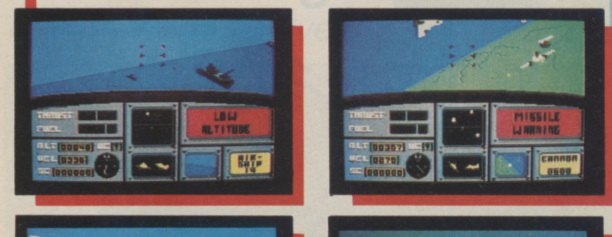

Screen shots are for CBM 64 version. Other versions may vary.

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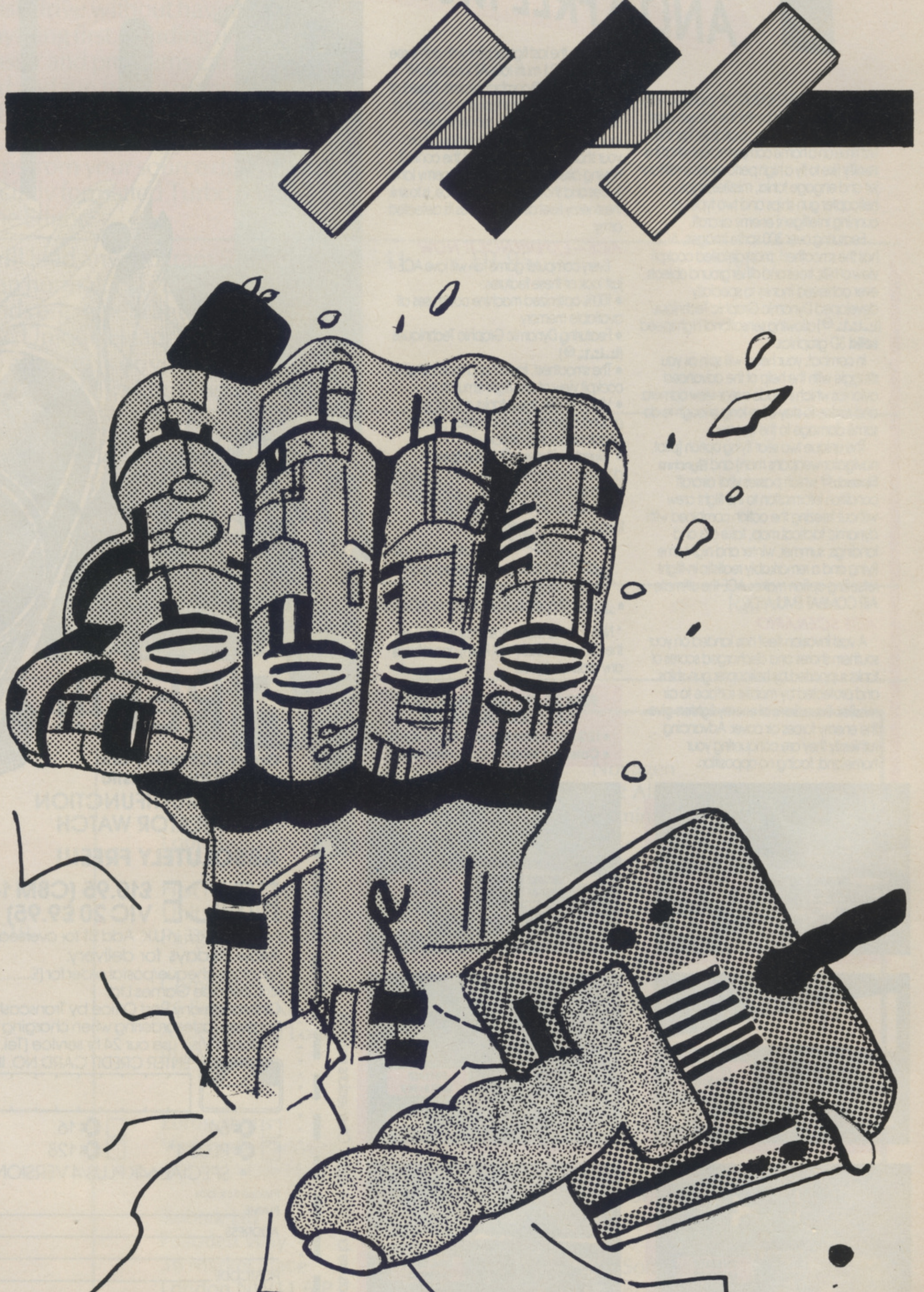
GAME KILLER



Unless you spend all your time playing games (what, like you? Ed), it becomes extremely frustrating to get to a certain point on a game that has cost you ten pounds only to find you can get no further.

Some games have built in cheat modes so that the player can try each level (the most famous perhaps is 'I WANT TO CHEAT' on the Monty high score), and when these get leaked out the rest of the world knows. Now, however, Robtek's extremely clever new cartridge –'Game Killer' (£14.95) puts an end to all that!

In the past people have tried to make cartridges that slow the game down, but never very sucessfully. Game Killer approaches the problem differently. When you turn on the machine, you are shown a really nice display, with an accompanying Rob Hubbard soundtrack (he really is getting everywhere these days, a case of over exposure?).

What is really impressive about Game Killer is that it works! There are three different functions:

i) Disables all sprites – you cannot die!

ii) Disables sprite collision – you can shoot things, but you cannot be shot!

iii) Disables all background sprites.

If you are a regular games player you really should get hold of one of these cartridges. Although it works only on games where sprite collision is used, this includes almost all action games!

I did not find a game that refused to load due to it, and that fact alone suggests high quality. At £14.95 I cannot recommend it strongly enough!

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UTILITIES

cont'd from page 47

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The Print Shop

G.D. Richardson gets to know a Word-and-Picture Processor that sets you free to express yourself

At the Commodore show last Summer I saw 'the Print Shop'. It was love at first sight.

If you have any need for personalised greeting cards, posters, notices, Letterheads or Banners, this is the program for you.

It is easy to use, requires no knowledge of graphics or programming, and lets you view, select and assemble all the parts of a decorative message in minutes. There are eight types of lettering available, each in various sizes and forms (hollow, solid and 3-D) and 60 different 'Graphics' and 'Patterns' come on the original disk, with three extra disks containing 120 each available. Or you can design your own using the GRAPHIC EDITOR.

It loads fairly quickly (very quickly if you have 'The Final Cartridge') and presents a menu:

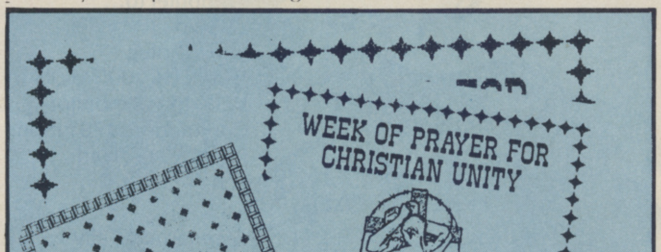
GREETING CARD: SIGN: LETTERHEAD: BANNER: SCREEN MAGIC: GRAPHIC EDITOR: SET UP.

SET UP is to choose your printer. The default is a Commodore dot-matrix type, though if you use this the graphics will not be quite so detailed as with an Epson or similar type.

Unfortunately there is no Centronics interface built in, but the program works with any of the hardware ones, including 'The Final Cartridge'. When you have completed the SET UP menu you press return and your printer types 'WELCOME TO THE PRINT SHOP'

"Easy to follow"

GREETING CARD is used to illustrate the method of using the program, though it is menu-driven step by step, so that you can hardly fail. If you are desperate to see some results there is even an option 'Ready-asked to first choose a border, and as you step down through the options the border changes accordingly. Next choose a 'Graphic' or 'Pattern' from the manual, by number or name, or no graphic at all. If you choose a graphic you are asked Large, Medium or Small? Choosing Medium or Small you will be asked if you wish them to be Made Cards'. If you choose 'Design Your Own' you are staggered over the page, tiled, or used in a 'Custom Layout'. This allows you to place them where you will. Next you choose the type of lettering you want, or 'Font' as it is called. As you move down the menu a window shows you the appearance of the Font. You are then asked to type your messasge for the front of the card. The letters appear in a window as you type, and may be centered automatically or right or left-justified as you wish on each line. There are two sizes, and the letters may be hollow, solid or 3-D. You are then asked if you want them centered top to bottom.



"Special Effects"

The whole process is repeated for the inside of the card so you can vary the border, font, graphics and message. The last menu then appears. Here you may "Give Yourself Credit" with a one line message on the back of the card such as 'Designed and Printed by ....', or 'Test Paper Position' which prints a line of very faint dots on what will be the top of the card. These should be exactly on the perforations if you are using tractor feed paper, and are mainly useful if you are using continuous fan-fold paper, but are invaluable if you wish to put paper through twice for special effects. You may choose any number of copies and then PRINT.

Your printer begins its run and you will see your card appear. The Greetings Card is printed in four quarters, the first two upside down, so that when you fold it everything will be right way up. I used this program to send individualised Christmas Cards last year, which were greatly admired. I could then pose as a programming genius when everyone wanted to know how they were done.

If you can get coloured ribbons for your printer or use coloured paper you can create still better effects.

SIGN works in similar manner to GREETING CARD but prints an A4 size single-sheet poster. This will enlarge on a photocopier to make large striking posters.

LETTERHEAD does what it says, printing a heading and footing, with graphics if desired, on A4 paper.

BANNER is probably the most amazing section of them all. It prints letters and graphics up to 6 inches high lengthwise on roll or fan-fold paper-great for Garden Fetes, weddings, carnivals or charity bazaars.

SCREEN MAGIC is really a quite different program, enabling you to print out computer-generated patterns, with or without lettering: useful for small notices. I have seen a number of Exhibitors using them at Computer Shows.

"Design your own graphics"

The GRAPHIC EDITOR enables you to design your own graphics, or alter the ones supplied. There are, strangely enough, no churches on the graphics disk, so I designed a picture of Kirksworth Church for my friend the vicar, and it is now recognisable on all the posters I do for him. A local school asked if I could do a Peacock for their magazine cover. That was a challenge, but I don't think it came out too badly (in fact I'm jolly proud of it!) You may use the keyboard to enter pixel by pixel (time-consuming but very accurate), a joystick, or even a Koala Pad.

Now available in America is the 'Print Shop Companion' with new typestyles, dozens of new borders, calendar maker, and an enhanced Graphic Editor with mirror-imaging, flood-fill patterns and mouse control. They also have coloured high-quality fan fold paper and envelopes and many more colours of ribbon.

I can't wait....!!

The program is available in this country from good software dealers such as The 64 Software Centre, Princeton St., London and costs about £45. Considering the money you could save (or make) using it, it's the bargain of the year.

Toolkit IV

A comprehensive disk utility with programs ranging from useful to bizarre is reviewed by GD Richardson.

I came across this disk utility, Toolkit IV, when I was looking for something to speed up back-up making on my 1541 Drive. This occupation is the boring one I know, especially if there are several disks to be copied, and a really fast copier is much to be desired. I was also concerned that I had absolutely no idea what to do when a database or letter disk was accidentally corrupted, as was happening all too often with an (unknown to me) misaligned drive.

Toolkit is designed specifically for the 1541 Disk Drive (or the 1570 in 1541 mode). It is not a single program, but a collection of programs accessed from a main menu. These programs range from the extremely useful to the totally bizarre. Does anyone really want to play "Daisy" or 'God save the Queen' on their disk drive?

"Fast and reliable"

The two or three really basic and very useful programs which even a beginner will want to use are the various disk (unprotected) and file copiers. These are the fastest I have ever come across, and very reliable. The FAST DISK COPY will copy a full disk in well under two minutes, even allowing for clumsy disk changing. I have timed it!! If you choose the option where only those parts of the disk indicated by the Block Allocation Map (BAM) are copied it is swifter still. Even taking into consideration the program loading time (about 40 seconds) it is a practical proposition, and if you do several different back-ups at a time then it is even better. There are two file copiers, one, for the older Commodore 64's, working at three times normal speed, and the other, for more recent versions, working at five times normal.

ERROR LOOK enables you to find all the errors which software houses deliberately put on their disks, and which the program looks for before it will run. All manner of errors can be located, even those such as half-tracking (writing a track half-way between two normal tracks) which the author assures us are rarely if ever used.

ERROR MAKE allows you to create said errors so that a back-up will run. There is much dispute about the legitimacy of such tactics. Anyone doing it for money rather than convenience would find the process too time-consuming to be worthwhile.

"Does amazing things"

FORMAT will do some amazing things, including formatting a disk norrnally in 10 seconds, and will also enable you to create new disk formats. I could wish that the normal fast format command did not ask for the disk ID to be given in Hexagesimal notation, though admittedly there is a conversion table on the back of the instructions.

DISK LOG gives you, among other things, the loading and end address of every file on the disk, which is essential if you wish to use the machine code FILE COMPACTOR, which when it works can reduce a 200 block programme to almost half its previous size with corresponding advantages in disk space saving and loading.

"Finding lost files"

DISK DOCTOR will read every block on a disk and enable you to rewrite any part of it. It also lets you know if you are dealing with a renumbered track or sector. If you have lost a long or very important file through a disk error you may search for it on the disk, then change the two bytes (characters) in front of the file name in the Directory to indicate the correct track and sector where the file may be found. I have rescued two or three files which wouldn't load after the dreaded @ bug had struck. This for the uninitiated is a hotly-disputed fault in the drive operating system (DOS) which allegedly strikes programs or programmers using the 'save and replace' routine with the command SAVE "@0:filename". I am told that if you always specify the drive number it is less liable to strike. Many people have gone years without experiencing it.

There are numerous other programs on the Toolkit disk, including a Disk Monitor, a Header/Gap Editor and a Disk Command-File Maker, one of whose built-in files will cause the disk-head to move much more rapidly back and forward across the disk, so speeding up programs which access the disk a lot.

There are many parts of Toolkit which require a deeper knowledge than I possess to utilise to the full, and there is a tendency for the very detailed instruction sheets to assume that the user knows as much as the author, but anyone who wants some really fast copiers and the ability to learn the workings of their disk drive will get more than their money's worth. Users of the older version Toolkit II may send the original disk and £10 for an upgrade.

Contact: MPS Software, 36 Alexandra Grove, London N4. Tel: 01-800 3592

Less Interference!

Duraplug Electrical Limited has released a Mains Filter Adaptor which plugs straight into the wall and gives a constant supply of electricity without the problems of spikes or varied voltage.

The Mains Filter Adaptor sells for around £18, but for more details contact Duraplug on 0843-68771.

Two For One — More Fun?

MBS Data efficiency have produced a product that allows two printers to be shared by two micros. This would mean that two computers could share a daisy wheel and a graphics printer — without swopping cables. Prices for a centronics two way crossover switch start at around £165.

For more details contact Data efficiency on 0442-60155.

Thinklab Expands

3D, the scientific and industrial interface systems people, have recently announced some powerful new additions to their flexible and popular 'Thinklab'.

The first module is a 4.5 digit analog to digital converter, which includes eight differential amplifiers and multiplexer. The second module is is a full 12-bit analog to digital converter with sample and hold amplifier. Finally, there is a 8 digit universal counter/timer with a crystal controlled programmable oscillator.

The Thinklab can be linked up to a wide variety of computers, including Commodores. For information contact 3D Ltd on 01-387 7388.

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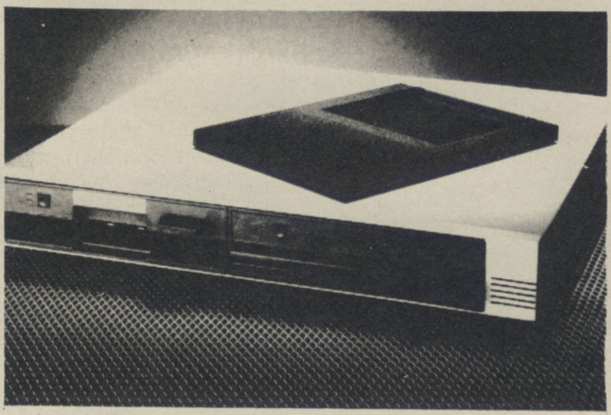
MUSIC EXPANSION SYSTEM FOR THE COMMODORE 64 AND 128
Commodore
Includes Full Size 5 Octave Music Keyboard

Commodore Launches New Music Systems

Commodore chose the Ideal Home Exhibition to release two new music systems for the 64/128. The first is the complete music system, including a Commodore 64, at £329.99. Without the 64 the system comes at under £150.

What is so special about this system (as our review elsewhere shows) is the sound expander which plugs directly into the 64 and provides powerful sound facilities, using the lastest in FM sound technology (previously used on the Yamaha DX7 range of synthesisers). The 24 preset voices should prove adequate for most budding Vangelis'.

Both systems include a full five octave music keyboard — something normally associated with professional equipment, and software suitable for the beginner.



Removable Storage

Apstor have recently introduced a half height version of its 10 + 10 removable cartridge system suitable for many micros, including the Commodore business range.

The system which gives you 20 Mbytes of storage costs £3;450, with extra 10 Mbyte cartridges costing £85 each.

Much More From Ariola

Following good response to DEGAS, Ariolasoft have decided to introduce four more 'affordable, powerful and easy to use productivity programs'.

The first is Paperclip, a comprehensive wordprocessor for the 64, and on the reverse side of the disk has an improved version with more features for the 128. Priced at £44.95 it should be available in the shops now.

Homepak, is a three-in-one system suitable for home or small business use. Included is a wordprocessor, a fast data manager, and a telecommunications package for use with databases and other computers. Priced at £34.95 it must represent good value for money.

The Consultant is a package suitable for home and low-end business use. It is a professional database management system which can organise, sort and retrieve records — as well as analysis procedures. Reasonably priced at £44.95 for the 64/128 it is available immediately.

Lastly is Cut and Paste. Originally produced in the States by respected software house Electronic Arts, Cut and Paste features dynamic menus and full cut and paste facilities in a comprehensive and very simple to use package. This will be released a little after the others and will cost only £24.95.

For more details of these products, contact Ariolasoft UK on 01-836 3411.

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Wanted Audiogenic Renaissance Othello cartridge for Vic-20 (£5?) Also wanted VIC Computing Issues 1-4. Please write Duncan Harrison, Flat 97, The Green, Fitton Hill, Oldham OL8 2LS.

8032SK computer as new £300 4032 (upgrade 3032) £125. MPS 801 printer new, unused £95. 64 Modem new, unused, years Compunet subscription £70. All plus carriage. Phone Helensburgh (0436) 3022.

Nearly new CBM 64 boxed with datasette ref guide. Plus 26 titles like Entombed, Staff of Kamuth, Summer Games II, Beach Head II + Quickshot II. Joystick for £230. Tel: 467 7897 (after 4pm).

For Sale Vic 20 & C2N recorder + 3K, 8K, 16K. Switchable Ram pack + 2 manuals 47 cartridges + 24 software tapes + joysticks. Lots of fast action games, £105 the lot. Write Mark Sorrell, 14 Squires Walk, Kempsey, Worcester WR5 3JB. Tel: Worcester 820343.

Wanted, C16 penpals to exchange ideas, views etc. For sale, Dorks Dilema £3.00. Write to Mark Oakley, 2 Elmore Road, Longthorpe, Peterboro, Cambs PE3 6PT or phone 0733 – 266449.

Epson FX 100 printer £300 Centronics lead and manual included. Phone Walton-on-Thames (0932) 241242.

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Final cartridge: Save, yourself £20, if two people will purchase above with me (write soon). Send cheque for £30 or write to Mr N. Birds, Shawcroft, Biggin, Hartington, Buxton, Derbyshire SK17 ODH.

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CBM 4023P printer, brand new, £250; CBM MPP1361 printer, 132 col, 160 cps, psuedo – letter quality £475; also CBM 715 computer, 256K, £700; CBM 8250 LP dual drives (2 MB) – £700. Phone Lionel 01-237 7789.

CBM 64 with 1541 disk drive, 1701 colour monitor, Easy Script and Joystick, manuals £420 o.n.o. 01-226 8688. After 8pm.

American student wants penpals. Get latest and useful news, programs and products. Exchange latest programs. Send photograph of you and your computer. I have over 4,000 games and educational programs. M. Hyder, Florida Air Academy, 1950 S. Academy Drive, Melbourne, Florida 32901 U.S.A.

C.C.I. Back issues for sale?? Need Jan 85, Sept 85. Write S.J.G., 39B Ossian Rd, London N4.

C64 owner wants to swap programs, views and knowledge with people all over the world. Send list to Glen Mason, 17 Kirton Close, Blackthorn, Northampton NN3 4EN, England.

I would like to get the newest programs coming out for sale in England. Especially I long for "NEWS ROOM" for the CBM64. Also good old programs welcome. Erwin Gutdeutsch Tresdorfer Strasse 9, A-2100 Leobendorf, Austria.

Commodore 64 computer in good condition. Still under guarantee. Plus C2N tape recorder, joystick, approx 60 games, instruction manual. Total worth over £600. Selling for £150. Tel: 01-989 9217. Evenings only.

Malaysian computer user would like to have penpals. I have C64, Apple, IBM, Sinclair, Atari. Software exchange. Please send list. Write to: Hazman Halid, 53 Jalan Gasing, 46000 P. Jaya, Selangor, W. Malaysia.

Commodore printer plotter. New £45. Call/write 16 Hatherley House, Westbury Rd, London E17 65D. Will post.

Great offer. 1541 Disk drive. 20 disks full of programs inc. Easy Script, Video Basic etc. £150. Also MPS 801 printer with half a box of paper £150. Tel: Paul on (0246) 472963.

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Monitor Amber unit CBM 64 in use now. £40 o.n.o. Buyer collects. Milton Keynes. Ring Powell, Milton Keynes 566087. Leave message if out.

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MPS 801 printer brand new, unused £80 plus postage (or collect), phone or write to 28 Bourchier Close, Bampton, Tiverton, Devon EX16 9AG (0398) 31821.

Commodore SX64, new. Will haggle around £375. Wanted 5¼ disks at reasonable prices. Telephone 061 941 3102.

C-64 tapes, disks, ROMs, original titles for sale. Vic-20 predator ROM £8. For sale. Wanted: Magic Voice ROM & cheap video digitiser for C-64. Write John, 30 Highwood Ave, Finchley, London N12 8QP.

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